IATBR NEWS

International Association for Travel Behaviour Research

Vol. 5 - January 2025

CONTENTS











Message from the Chair of IATBR

Chair: Charisma Choudhury

Charisma Choudhury is a Professor of Behaviour Modelling at the Institute for Transport Studies and School of Civil Engineering at the University of Leeds (UoL) where she leads the Choice Modelling Research Group. Charisma's current research focuses on leveraging emerging data sources for travel behaviour modelling, especially in the context of the Global South and Green Transport. These datasets range from passively generated data sources (e.g. mobile phone records, smart cards, video images, etc.) to physiological sensor data (e.g. skin conductance, EEG recordings, etc.). Research excellence in this area has enabled her to win the Alan Turing Fellowship (2018 -2022), Faculty for Future Award 2011 and the UKRI Future Leader Fellowship 2020. She is the current Chair of IATBR.

It is my pleasure to invite you all to read yet another exciting issue of IATBR NEWS led and edited by Taha Rashidi.

The focus of this issue, *Responsible Transport*, could not have been more timely. Responsible transport emphasizes minimizing environmental impact, promoting inclusive access, and fostering safety across all modes of travel. It aligns with the urgent need to reduce carbon emissions by encouraging the use of public transit, active transportation, and the adoption of emerging clean technologies. Equally, responsible transport must prioritize social equity by ensuring that people from all segments of society benefit from accessible, affordable, and efficient mobility solutions. Responsible transport is the cornerstone for sustainable and equitable mobility worldwide – an ethos that resonates closely with us, the **IATBR community**. By integrating behavioural insights into policy and infrastructure planning, we, as a community, can create transport systems that not only enhance economic vitality but also preserve the environment for future generations. The collective effort of researchers, policymakers, and practitioners is essential to drive innovation and implement strategies that redefine mobility in a responsible manner.

In addition to the exciting articles in this issue, I would like to use this opportunity to highlight the IATBR activities this year. The highlight of this year was the 17th International Conference on Travel Behaviour Research organised by **Yusak Susilo** at the University of Natural Resources and Life Sciences (BOKU), Vienna 14-18 July 2024. Thanks to the meticulous efforts of Yusak (and his organizing team and volunteers), we had five days full of exciting presentations, thought-provoking discussions, interesting excursions, and relaxing social activities. It provided the perfect platform for exchanging ideas that I believe would lead to many exciting new collaborations. Thanks to all the participants who travelled from different parts of the world to make this conference so stimulating. With over 500 participants from 42 countries, the conference simply could not have been better.

As part of our pledge to make the conference materials accessible to those who could not attend IATBR 2024 in person due to logistic reasons (or chose not to travel to limit their carbon footprint), the keynote presentations have now been shared on the IATBR YouTube Channel (Link[1]).

As a follow-up to the IATBR Conference, 11 special issues are in progress in the leading transport journals as the publication channel of selected papers presented at the conference. As part of the 'IATBR Operation 100% OPEN SCIENCE' led by **Joan Walker**, we are working towards the goal that 100% of the papers published in the IATBR Special Issues from the 2024 Vienna Conference will follow open science principles, namely:

- *The manuscript, or a pre-print version thereof, is publicly accessible for free and contains all relevant information to reproduce the research.*
- *The final code and final (processed) dataset necessary to produce the results in the paper are available online in a public repository and can be accessed for free.*

We understand that sharing the codes and data is not a feasible option for all the papers and hence, not a mandatory requirement for publication of the paper in IATBR 2024 special issues, it will be very much appreciated if you do so. As the IATBR community, we can collectively contribute to creating the processes, definitions, and practices for open science in our field. Even if we cannot reach the 100% OPEN SCIENCE target at this conference, I hope we will make a good start on the journey through this exercise and increase the percentage of papers that adhere to the OPEN SCIENCE principles, published via the IATBR channel and beyond.

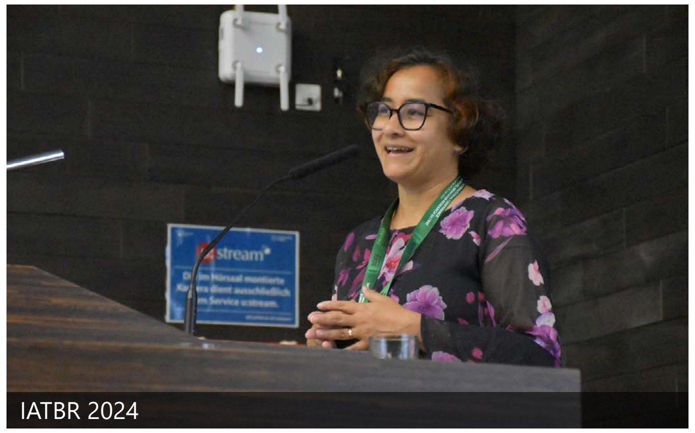
We are also gearing up to resume the IATBR Online Seminars from early 2025. The next seminar will be a special seminar by Hani Mahmassani, a pioneer of the IATBR community and one of the two winners of the 2024 IATBR Lifetime Achievement Award. In the summer, we will have a seminar focusing on 'Travel Behaviour Research in Africa' (led by **Mark Zuidgeest**, University of Cape Town). It may be noted that our previous seminars focussing on travel behaviour in different parts of the world can be watched online at the IATBR YouTube Channel (Link[2]). After the successful completion of the 'Around the World with IATBR' Seminar Series, we are planning to start thematic seminars in Fall 2025 (led by **Prateek Bansal**, National University of Singapore). You are welcome to share your ideas and volunteer to help Prateek in organising a thematic seminar. Stay tuned!

The IATBR Eric Pas Jury Board is in the process of selecting the 2023 Eric Pas Recipient. This year the Jury Board was led by **Alexa Delbosc** (Chair) and comprised of **Tomer Toledo** and **Juan Carrasco** (Regular Members) and **Kari Watkins** and **Francisco Pereira** (Ad-hoc Members). They received 14 high-quality dissertations for the award and will announce the winner at the IATBR Meeting at the 104th Annual Meeting of the Transportation Research Board, Washington DC.

Finally, **Taha Rashidi** and **Jennifer Kent** have got the ball rolling for the organisation of the 18th International Conference on Travel Behaviour Research. So mark your calendars for attending our next conference in **Sydney (13-17 December 2027)** to continue your journey with the IATBR community!

Wishing you all a great start to 2025!

Best regards,
Charisma Choudhury



1 https://www.youtube.com/watch?v=VFjtuAoM-RLI&list=PLBR3Q0pfDRt10vjYej5cWAeWncJUpeYgX

2 https://www.youtube.com/@iatbr5598

Responsible Transportation

With or without AI, we need to responsibly design future transport systems

BACKGROUND

Keeping the original mission of this newsletter, this issue will bring discussions around another visionary but plausible theme to the attention of travel modellers worldwide. The fifth issue focuses on an emerging area that is quickly reshaping and redefining itself. **Sustainable transport systems, planning, and development** have long been discussed in the literature by travel behaviour modellers, where **emission, accessibility, equity and energy consumption** are identified among the core pillars. With the emergence of artificial intelligence (see issue 3[1]) concerns about **responsible AI**, **ethics**, and **morality** are redefining the boundaries of a sustainable transport system integrated into a smart and digitised urban design. Robots, autonomous vehicles and dynamic micro-taxing/tolling sensing mechanisms enforce stronger roles for **non-human decision-makers** who are not responsible for their decisions, with businesses providing them governing and bearing the responsibility of decisions made, which might result in a fatal accident.

This issue invited articles to elaborate on **how a transport system can be ethically defined and designed.** Methods quantifying the responsibility of agents involved in a transport system enabled by artificial intelligence making decisions on behalf of people are invited to be introduced and elaborated on in this issue.

In addition, following the first three episodes of interviews with reputable scholars in the area of travel behaviour (Sergio Jara-Diaz and Juan de Dios Ortúzar in issue 2, David Hensher in Issue 3 and Hani Mahmassani in issue 4), an interesting interview with Prof Kay Axhausen is presented in this issue, following the new section introduced to the newsletter in issue 4, **a young academic**, the most recent Eric Pas Awardee offers insights about his research.

With the help of Prof Chandra Bhat, a new section is offered in this issue, which refers to the newsletter published in the last 90s edited by Chandra. In the following issue, we will present the *“From the IATBR Newsletter Archives”* column covering interesting news of those old days.

IATBR NEWS welcomes volunteers to help Taha Rashidi improve the quality of the NEWS. This is a piece for the community that requires many to help keep a record of our identity, celebrate our achievements, and preserve our history for future generations. Please step forward and help this mission.

1 https://iatbr.weebly.com/september-2023.html

Source: Midjourney; Prompt = An illustration of A pair of hands holding a miniature beautiful green city with skyscrapers , people walking and riding a bike, widmills, buses, a train, an airplane, children flying kites, and cars, trees and nature, highly detailed, white background

EDITOR: TAHA RASHIDI

Taha Rashidi is a professor of transport engineering at the School of Civil and Environmental Engineering at UNSW and the director of the Research Centre for Integrated Transport Innovation (PCI). Prof Rashidi is currently leading research into the interconnectivity between travel behaviour and time use and the potential of new mobility technologies to influence this paradigm. Taha is also examining the capacity of social media data to complement existing data resources as part of the development of an integrated multi-level modelling framework to demonstrate the relationships between land use and transport systems and the consequences this has for city planning and travel behaviour more broadly.

Design, artwork, and formatting: Maryam Bostanara

An Interview with Professor Kay Axhausen
Personal and Professional Life

AUTHOR: TAHA RASHIDI

INTERVIEWEE: Kay Axhausen

In academia, we often invent and introduce innovative discoveries and theories. However, academics might struggle to translate their discoveries into practice and policy. It might be astonishing to them that practitioners, professionals, policymakers, and government agencies do not adopt and use advanced and efficient methods and algorithms invented by the academic community. Academics proudly hold their discoveries high and ask professionals if they have a problem to be solved with their innovation. This cycle needs to be reversed for a transport engineer to first learn the problem and then discover a solution.

Prof. Kay Axhausen masters the skill of translating his discoveries into practice, identifying problems, proposing solutions, and connecting academia to the profession. He has helped our community bring forward our innovative methods, present them to professionals, and convince them to adopt advanced modelling techniques. Kay believes that academics and their PhD students must ensure the PhD project/thesis has clear policy implications. This should become a common practice to ensure theory can be translated reasonably fast into practice by inventors and scientists, who pioneer to bring knowledge to light.

To learn how Kay learned and eventually mastered contributing to the boundaries of science and simultaneously exporting his knowledge to practice, I met and discussed with Kay his professional journey while he was enjoying his breakfast and I was enjoying the warm weather in Sydney in February 2024.

Born in 1958 into an academic family that included mainly doctors, Kay decided to become an engineer at Karlsruhe Institute of Technology, specialising in planning, transport, and traffic. As life became more predictable and boring, Kay decided to pursue a PhD. At Berkeley, Carlos Daganzo, who was in charge of admissions, wrote back offering him admission for the year after. Georgia Tech did not reply, and MIT also offered an admission for the coming year. The University of Wisconsin offered a nice package for the current year, convincing Kay to join UW. Bob Smith was his supervisor, and he got a great education by getting exposed to OR, stats, and planning classes. His first two TRB papers were published as a master's student. He attended his first TRB in 1983.

At UW, Kay had access to an IBM PC, one of the first versions of which a professor of civil engineering wrote a processing program. Kay then translated the manual because the professor hoped to sell it in Germany.

The lifestyle of a professor in the US, especially in small town Wisconsin or elsewhere, which did not have a decent bookstore for example, was not appealing to the young Kay, who was thinking at the time about a civil servant career at a local authority doing transport planning.

So he went back to Germany, where he could be paid a decent salary as an employee of the university as a PhD student under the supervision of Wilhelm Leutzbach. At the time, Rainer Wiedemann was the other professor at the Institute für Verkehrwessen (IfV - Institute for Transport Studies) whose graduates developed VISUM, but especially VISSIM, which was implemented based on Wiedemann's traffic flow models. Thomas Schwerdtfeger, who was one generation before Kay, followed other IfV PhDs, Hans Hubschneider and Michael Sahling, who had set up PTV, at the time. It was common to have software attached to a PhD thesis at IfV. PTV was shaped at KIT, given the culture of producing simulation software as part of the research.

Because of his tenure in the US and the appeal of attending TRB, Kay prepared one paper per year for TRB (almost). His first research project was on looking at emissions, pollution, and certain motor functionality. Kay wished he had continued in this direction before the current understanding that global warming is paramount.

As a PhD student, Kay reshaped a proposal to develop an agent-based simulation of travel demand for the simulation of parking. Kay sees the freedom given to him and the other PhD students (e.g. Martin Fellendorf, Peter Vortisch) under the supervision of Leutzbach, and Wiedemann helped them develop skills like project management and delivery at an early age. His own proposal on cycling simulation was eventually funded by DFG, the German Research Foundation. The funded project was delivered by someone else, and Kay jumped on another project written by U. Sparman to reimplement ORIENT developed by Zumkeller and others, which was an agent-based simulation of travel demand. Being the TA of Wiedemann, Kay learned traffic flow and merged it with agent-based demand simulation in his thesis. The simultaneous process of updating congestion due to demand made the his simulation slow, which was later amended by Kay Nagel's contributions, having roots in his PhD. Once the software was completed, it was applied to Pforzheim, a small

> ***"Kay sees the freedom given to him and the other PhD students (e.g. Martin Fellendorf, Peter Vortisch) under the supervision of Leutzbach, and Wiedemann helped them develop skills like project management and delivery at an early age."***

Source: Midjourney; Prompt = an illustration of a young male PhD graduate, in graduation attire, with a graduation hat, a rectangular icon, a city background featuring transport elements, buses, city, illustration, highly detailed background

town close to Karlsruhe, for which he had the necessary data as part of planning projects of Leutzbach. Kay was asked to run the household travel diary survey for Pforzheim as his first experience with an HTS to be used in his demand simulation model. At this stage, Kay could see himself as a demand modeller, which has roots in one of his papers during his master's education, which was an SP and a choice model on preference for particular types of cycling infrastructure, once again another project of his early career that is linked to his latest project ebikecity (See ebikecity.ch). At the time, he entertained the first papers of Jordan Louviere in 1983-84, as well as the works by Moshe and other works by Andrew Daly. That overlapped with when Daimler Benz started the Karl Benz-Stiftung institution supporting PhD students, which was still unpopular in Germany to go overseas. Kay applied to the scheme because he was fascinated by parking modelling using ABMs. He secured funding for half a year to visit the Transport Studies Unit at the University of Oxford, where he met Peter Jones, Phil Goodwin, Margaret Grieco, and John Polak.

The team Kay worked with was quite young at the time; John was one year older, and Peter and Margaret were 10 years older than Kay. He finished his thesis while at Oxford. There was a large interest in Europe in accelerating and advancing research, particularly for the car industry (DRIVE Program), which aimed at bringing research into practice. In 1989, he wrote one proposal in collaboration with Karlsruhe and Oxford with French and Dutch partners. This project became EUROTPP. The project was supposed to support Kay in doing his postdoc at KIT. Still, due to some organisational issues, he could not process that and ended up using the money to support his postdoc at Oxford University. This project was an example of an organic collaboration in which, in Kay's opinion, people can engage and contribute toward a common goal. Alternatively, in projects where people team up with disparate very loosely connected pieces to win a large project, failure is likely. Large projects have a higher chance of being impactful with a diverse portfolio of talents, as long as the team has the commitment to a common theme or, even better, a joint output that everyone wants to achieve.

Later, Kay met Philippe Toint and his PhD student, Michel Bierlaire. The same story of the culture of commercialisation in Europe happened to Michel as he was working with a Belgian firm that wanted to commercialise choice modelling, which ended up becoming Biogeme. Kay then moved to his first lecturer position at Imperial College in London. Kay did not try the adventure of moving to an American university because he was and still is of the opinion that American universities do not easily welcome European graduates, as PhD students are trained differently in the US compared to Europe. Still, Kay likes the American education system because it works better for median students and grounds them in the current state of the art. It forces them to interact with the current literature at a very intense level. Still, the problem with the US system, in Kay's opinion, is that students end up becoming cheap labour. This is even worse for postdocs, now allowing them to go anywhere. This contrasts with German-speaking areas where postdocs are fully employed, like normal academics.

"Large projects have a higher chance of being impactful with a diverse portfolio of talents, as long as the team has the commitment to a common theme or, even better, a joint output that everyone wants to achieve."

Source: Midjourney; Prompt = The three-dimensional "AI" letters are composed of layers of overlapping paper bases, and the background is a panoramic view of a future city. The paper buildings are light and three-dimensional like paper cuts, and bright sunlight falls on this paper art city, showing the unique integration of technology and art,Multi-dimensional paper kirigami craft,Multi-dimensional paper kirigami craft,

"Kay is suspicious of how much AI will replace our profession because AI does not yet understand the underlying structure."

Kay is suspicious of how much AI will replace our profession because AI does not yet understand the underlying structure. For example, we cannot yet expect AI to design an HTS or fit the design to the purposes of a specific policy or design. Kay argues that we have not yet written a proper 99.9999% effective spam checker, so why do we expect AI to design the deep logical structures of our behaviour and societies?

Talking about other emerging topics in the field moved our conversation to global warming. Kay admits that global warming was not on his horizon until the last couple of years, which appears to be a shortcoming for the community as well. The same applies to our extensive focus on predictions of traffic demand and flow with substantial achievements in this area, while transport planning work kind of sticks with small local improvements. With sustainability, we should have addressed the crisis earlier, and we failed until observing the 1.5-degree increase call upon the international community, including transport engineers, to implement effective solutions quickly. Kay believes EVs are not the solution, though they are contributing to the solution. What is missing about EVs relates to their embedded CO2 in manufacturing them and how their lower operating costs bring forward induced demand.

The challenges of EVs convinced Kay to reconsider using bikes as the main mode of transport in the modern urban world. The ebikecity project is designed to address these challenges of the current policies to address global warming, especially pricing with equity concerns. The mission of the project is to make cycling safe by allowing more space allocated to biking to travel at the same speed that cars travel in urban areas. The epidemiology of developing ebikecity is critical for Kay as he believes more of such holistic, out-of-the-box, and innovative solutions can address the global warming challenge. Ebikecity

"Kay believes EVs are not the solution, though they are contributing to the solution."

pivots around the unpopularity of pricing schemes and mass electrification of the network, which is falling short of resulting in a major paradigm shift in how people travel and how carbon is generated/saved. This is a crucial point being missed that the scale of the problem is still being dismissed by transport engineers that using our classical methods of demand management, pricing, and capacity increasing, we will not get anywhere close to the targets of carbon saving by 2030 and 2024. I really liked the angle Kay looks at the problem.

When I asked Kay about major scholars in the field, Kay refrained from naming any. Still, after I insisted, he offered a long list, not limited to Moshe, Pat, Peter Jones, Piet Bovy, Andrew Daly, Harry Timmermans, Juan Dios, and Pilo Willumson.

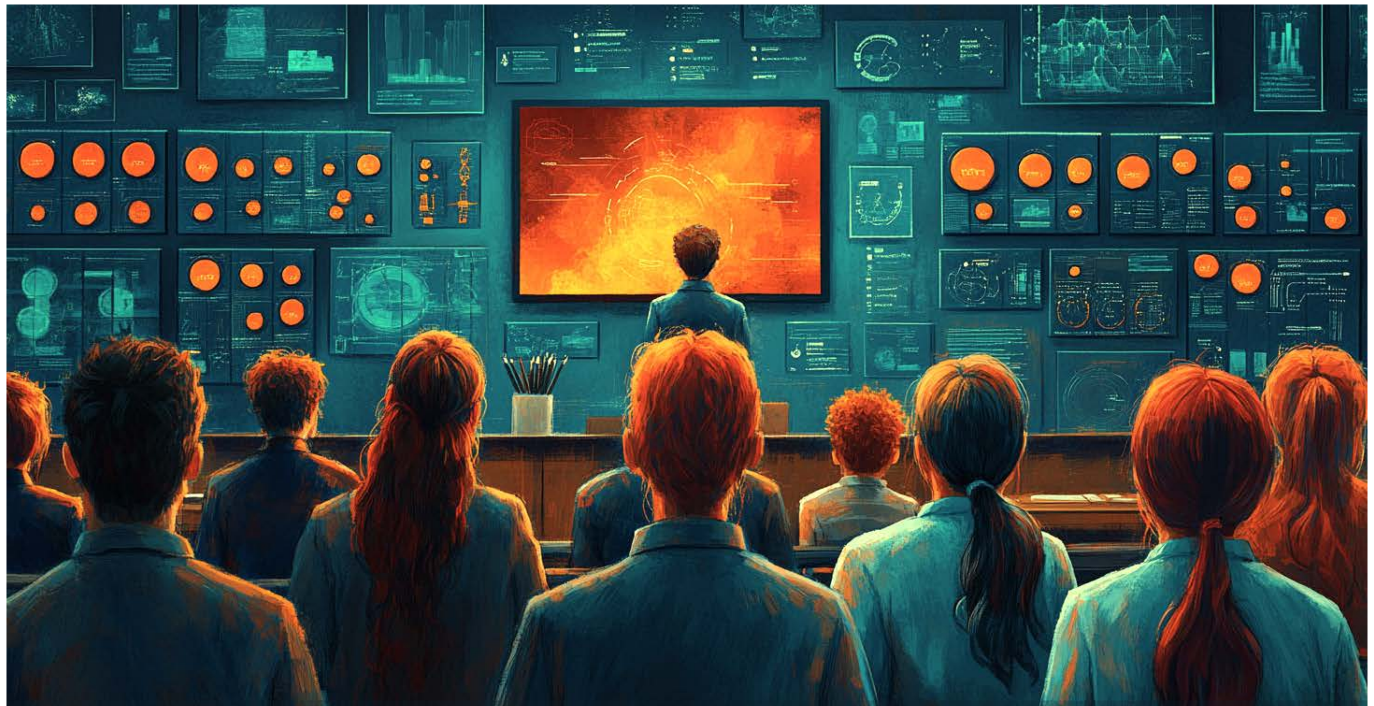
“Kay is a strong advocate of open-source data and models. Like the R community, a common practice should be to include data as part of published papers.”

Kay is a strong advocate of open-source data and models. Like the R community, a common practice should be to include data as part of published papers. The discipline should be able to cross-validate research studies and projects. This idea may look obvious but practising it might be a cultural and commercial challenge. Hearing this idea and concern from Kay as his closing statement made me recall my beginning statement that Kay masters translation of knowledge to practice therefore I need to emphasise the importance of this point that we need to proactively think, work and champion the idea of having open sources data, models, and codes and develop an open-access culture in our community to allow emerging challenging being collectively solved by all because they need many minds, not just a few.

“... we need to proactively think, work and champion the idea of having open sources data, models, and codes and develop an open-access culture in our community to allow emerging challenging being collectively solved by all because they need many minds, not just a few.”

Source: Midjourney; Prompt = male and female programmers with their laptops around a big table, a miniature city on the table, code, programming, transport, Artificial intelligence, wold map on the wall with points on it

From the IATBR Newsletter Archives



Source: Midjourney; Prompt =an illustration of people attending a presentation - presentation is about transport engineering and mathematics - background is full of mathematics and transport elements - illustration

AUTHOR: Chandra Bhat

Dr. Chandra R. Bhat has contributed to the formulation and use of statistical and econometric methods to analyze human choice behavior for transportation and urban policy design. He is a recipient of many awards, including the 2024 Joe King Professional Service Award from the University of Texas's Cockrell Engineering School, the 2022 Institute of Transportation Engineers (ITE) Theodore M. Matson Memorial Award, the 2017 Council of University Transportation Centers (CUTC) Lifetime Achievement Award, the 2015 American Society of Civil Engineers (ASCE) Frank M. Masters Award, and the 2013 German Humboldt Award. He was listed in 2017 as one of the top ten transportation thought leaders in academia by the Eno Foundation. Dr. Bhat currently serves as the Editor-in-Chief of Transportation Research – Part B, as well also as the Director of the USDOT-funded National Center on "Understanding the Future of Travel Behavior and Demand".

DID YOU KNOW

about the following highlights of the 1995 IATBR newsletter ?

1. A 1995 conference in Eindhoven, sponsored by IATBR and IATUR, brought together researchers to discuss advancements in activity-based travel analysis. The conference highlighted the need for improved data collection methods and model development in activity scheduling while exploring computational models, utility-maximizing approaches, and the complexities of in-home and out-of-home activity patterns.
2. The National Research Council of Canada developed "Screen Survey," a patent-pending software that automatically administers questionnaires on computer screens, offering a flexible, efficient alternative to traditional paper surveys with customizable forms and response types, automated scheduling, and demographic-based question tailoring, with data easily exportable for analysis.
3. The Institute of Transport Studies (ITS) at the University of Sydney has been designated a Commonwealth Key Centre of Teaching and Research in Transport Management, the first nationally recognized Centre of Excellence in Transport in Australia, joining forces with Monash University to expand transport courses across both institutions under the leadership of Professor David Hensher, with substantial government funding from 1995 to 2000.
4. Researchers at Kuwait University have developed time-series air travel demand models for key international markets, using population, GDP, trade flow, and airfares to forecast air travel demand, addressing unique factors like Kuwait's high expatriate population.
5. Hague Consulting Group has advanced model estimation techniques that combine Revealed and Stated Preference data to predict demand for large-scale transport infrastructure, such as fixed links and urban rail systems, with further enhancements to their ALOGIT software used globally.
6. The National Science Foundation's project led by Duke University is developing advanced activity-based travel models, including synthetic population generation and Bayesian estimation methods for car ownership, mode choice, and commuter responses in various U.S. cities.
7. Bureau Goudappel Coffeng in the Netherlands completed a study on forecasting future activity patterns using time budget data and transition matrices, revealing how demographic and behavioral changes may influence future activity tours. They also studied the impact of Dynamic Route Information Panels (DRIPs) on traffic behavior near major Dutch cities, with future research focusing on delay and travel time information.

Ethics of Climate Change:

It is real but are we misreading or over-reacting the impact on natural evolution of human settlement as the cause of the problem?

AUTHOR: DAVID HENSHER

Professor David Hensher is Founding Director of the Institute of Transport and Logistics Studies at The University of Sydney; a Fellow of the Australian Academy of Social Sciences; recipient of numerous awards including the 2009 International Association of Travel Behaviour Research (IATBR) Lifetime Achievement Award and the 2019 John Shaw Medal which honours an industry champion who has made a lasting contribution to Australia's roads. In 2021 an annual prize was established and named in honour of David for best paper in transport demand modelling at the Australasian Transport Research Forum (ATRF). He has published over 700 papers in leading international transport and economics journals as well as 18 books. He has over 77,000 citations of his contributions in Google scholar. Research.com, a leading academic platform for researchers, released the 2022 Edition of the Ranking of Top 1000 Scientists in the field of Economics and Finance and David is #1 in Australia. In January 2023, David was appointed a Member (AM) of the Order of Australia (OA). In 2020 David published a book on MaaS: Hensher, D.A., Mulley, C., Ho, C., Nelson, J., Smith, G. and Wong, Y. (2020) Understanding Mobility as a Service (MaaS) - Past, Present and Future.

There is no denying that the climate is changing; indeed, we might suggest constantly changing. This has occurred for thousands, if not millions of years, with recurring droughts, floods, tornadoes, earthquakes, heatwaves, and fires. This is nothing new and occurs both incrementally and seismically. For example, about 400,000 years ago, large parts of Greenland were ice-free, with scrubby tundra basking in the Sun's rays on the island's northwest highlands. Evidence suggests that a forest of spruce trees, buzzing with insects, covered the southern part of Greenland. Christ et al. (2023) pin the time of Greenland's last melting to some 400,000 years ago. In 2016, a study of a unique bedrock core drilled from under the centre of the Greenland ice sheet suggested that most or all of the ice covering Greenland had melted away at least once during the last 1.1 million years. This resulted in elevated sea levels and fertile land. A comparable example closer to home is the loss of the land bridges to Tasmania and New Guinea when sea levels rose ~12,000 years ago. This occurred during the climate warming process that ended the ice age that lasted from 30,000 BC to 10,000 BC.

What is new, at least over the last 200 years, is that these events are today occurring and being recorded in areas that we call human settlements, which in the distant past (and often less distant past) were affected by significant climate change events such as floods, fire and hurricanes, but not impacting humans to the same extent witnessed today because there were no (or very few) humans living in many of the affected areas (be they a floodplain, bushland, desert etc.) in most nations. What we now see is the exponential growth of human beings (i.e., population explosion) who, throughout the world, are increasingly settling on land that is often marginal, if not totally unsuitable, for human habitation and agglomerating in cities and megacities. In many countries, the infrastructure is not built to safe standards, and there is significant overcrowding and local poverty. This is a big part of the observed "climate" problem. Whether the land is suitable or not, it is relevant to acknowledge humans' poor stewardship of resources - over farming, overfishing, etc. The consequence is that the land is poorly managed, with significant negative impacts when nature decides to erupt for whatever reason.

A question of importance and much current debate is what role human beings have played in creating these climate catastrophes. They might be catastrophic for humans as seen as climate warming, frequent severe weather events, and the impact on communities of these events, but possibly not so for the earth on which we live, given they have been occurring for millions of years and the earth is still here in its many revised (positive or negative) forms. The often-claimed suggestion is that humans caused all of this. One might question the extent to which this claim is valid (The science is very imprecise and subject to significant error bands). While it is true that humans have modified

A question of importance and much current debate is what role human beings have played in creating these climate catastrophes.

Source: Midjourney; Prompt = green earth vs dry earth + climate change the sources of environmental degradation through developments designed to serve them well (so they typically believe) and have thus contributed to changes in the environmental context in which they reside and move around, it may well be that their contribution creates a correlational effect rather than a causal effect on the change in climate. In other words, human interaction may indeed deliver many undesirable outcomes such as increased local air pollution and increased carbon emissions, but whether this has been enough in itself to cause (i.e., contribute significantly to) non-marginal changing climate that has been occurring well before we built our high-density cities and encouraged sprawl, and we populated almost every part of the world and generated significant global mobility, must remain unanswered or at least questioned without full proof. A priori, correlation is not the same as causality, and we might all agree, but to date, the dominating causal thesis is the greenhouse effect linked to human activity, and it needs more careful consideration.

Time may show that the world will survive no matter what we do to reduce emissions and that it may be time to stop the alarmist rhetoric that does nothing to support sensible sustainability initiatives. Given an interest in transport emissions, a key contribution that is impossible to eliminate totally, we should reflect on the importance of transport to humankind's ability to cope with adverse weather events. How else will we support the communities that are affected, if not by the transport of people and supplies to and from the affected areas?

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A question that will remain unanswered for now is whether, when we eventually get CO2 emissions, blamed significantly on the transport sector, to a level we believe is what we need to be at, this will make any difference to the preservation of this magnificent earth. Some of us might question the commentary of extreme activists and the disproportionate amount of research focused on this topic.

We reiterate how important it is to distinguish between person-made microclimatic (local) impacts, some of which can be mitigated (with sufficient political will) by better building design, behaviour change programmes etc., and global effects that might occur anyway. A key reason why we blame humans for enhanced climate change beyond the catastrophic forces of nature in their absence is that humans are increasingly impacted because they are ever present everywhere, and they make unwise decisions like building on flood plains.

Acknowledgments
I thank Corinne Mulley, John Nelson, and Ian Christensen for their feedback.

Reference:

Christ, A.J. et al. (2023) Deglaciation of northwestern Greenland during Marine Isotope Stage 11, Science, 381, Issue 6655 pp. 330-335 DOI: 10.1126/science.ade4248.

A question that will remain unanswered for now is whether, when we eventually get CO2 emissions, blamed significantly on the transport sector, to a level we believe is what we need to be at, this will make any difference to the preservation of this magnificent earth.

Source: Midjourney; Prompt = A question mark besides earth

Transportation: Who is Responsible?

AUTHOR: Travis Waller

Professor S. Travis Waller is the Lighthouse Professor and Chair of Transport Modelling and Simulation at the Technische Universität Dresden, Germany. He was previously a Professor at UNSW, Sydney, the Australian National University (ANU) and the University of Texas at Austin, USA. At UNSW, he served as the Head of the School of Civil and Environmental Engineering as well as the Deputy Dean of Research for the Faculty of Engineering. He served as Founding Director for research centres at UT-Austin and UNSW. Travis has received some key awards for his field of professional activity including: being named one of the top 100 innovators in science and engineering in the world under 35 years of age by MIT's Technology Review magazine for his work on dynamic traffic analysis (2003), received the U.S. National Science Foundation CAREER award for his proposed research and teaching plan on adaptive network equilibrium (2004), named a Fellow of the Clyde E. Lee Endowed Professorship and Phil M. Ferguson Teaching Fellowship while at UT-Austin (approx. 2003-2011), gave the CC Mei Distinguished Lecture at MIT (2016), received both the Fred Burggraf Award (2009) as well as the Pyke Johnson Award (2019) from the U.S. Transportation Research Board (a division of the U.S. National Academies), and he was named a Fellow of the Institution of Engineers Australia in 2021.

Source: Midjourney; Prompt = an illustration of cars buses trains and bicycles running across the cities over the world map + highly detailed

As we drive further to the necessary accounting of more sustainable and just systems for the governance of human experience, we must move with careful but urgent purpose. For our particular research community, we need to help decarbonize our systems of mobility, that is clear. We have numerous challenges, including two I would highlight here:

(1) how to achieve the necessary behavioural change and,

(2) how to manage the resulting burdens that will surely come in this re-equilibration.

For the first, incentivization and credit schemes are clear strategies but with numerous considerations. Fortunately, transport researchers have been exploring some of these considerations for many decades within the congestion pricing literature. Even given limitations, with appropriately designed mechanisms, change should be possible if the costs reflect the true impact.

A "simplistic" approach is to include the cost of carbon offsets within mobility pricing. While there is debate if offsets can achieve the necessary impact, even if we take that as feasible, challenges still remain. Carbon pricing is easy in concept but can be a challenge in practice. A true accounting could lead to a complete reimagining to the underlying cost structure of mobility where entire supply chains must come into view to determine a ticket price, toll or Uber fee.

But, given our increasingly connected world with algorithm-run systems and ever-increasing quantifications, it does appear at least feasible that such an impact-driven accounting might be achievable. However, even if we can obtain the necessary behavioural change, further critical issues remain. For instance, would the new emerging mobility market be just? Is it inherently more fair than the old one? Any reasonable theory of justice would indicate that burdens should not fall on those already most disadvantaged. Further, it seems absolutely paramount that if we are to change our systems of management fundamentally, we must accept as a foundational principle that each new system must be an improvement over the past in terms of society-wide justice. If we cannot achieve this outcome, we simply need to return to the drawing board and start over until we find a better one. Alternatively, we would intentionally replace a society-wide system where our fundamental principles on justice, equity, and ethics would be degraded. Clearly, that is not an option, as any competent researcher could quickly predict the eventual outcome of that convergent series (i.e., it leads to tyranny).

It is difficult to answer whether the system would be more just. But these are all questions that should be central to our research in travel behaviour. We are world experts at discerning what might the human response be to new cost structures. But are those cost structures just? This question should be equally important to us.

Ultimately, concepts of responsibility, equity, fairness, sustainability and justice are inextricably intertwined. To deal with anyone without others will lead to real oppression. Further, any accounting based on some aggregate grouping will also lead to real oppression. Therefore, for the necessary accounting to come, we must do so comprehensively and individually. This is truly the most difficult work, but it is one where we should all hear and respond to the call responsibly.

Responsible AI
for Mobility and Transportation

Flora D. Salim. 2024. Responsible AI for Mobility and Transportation. 1, 1 (October 2024), 2 pages.

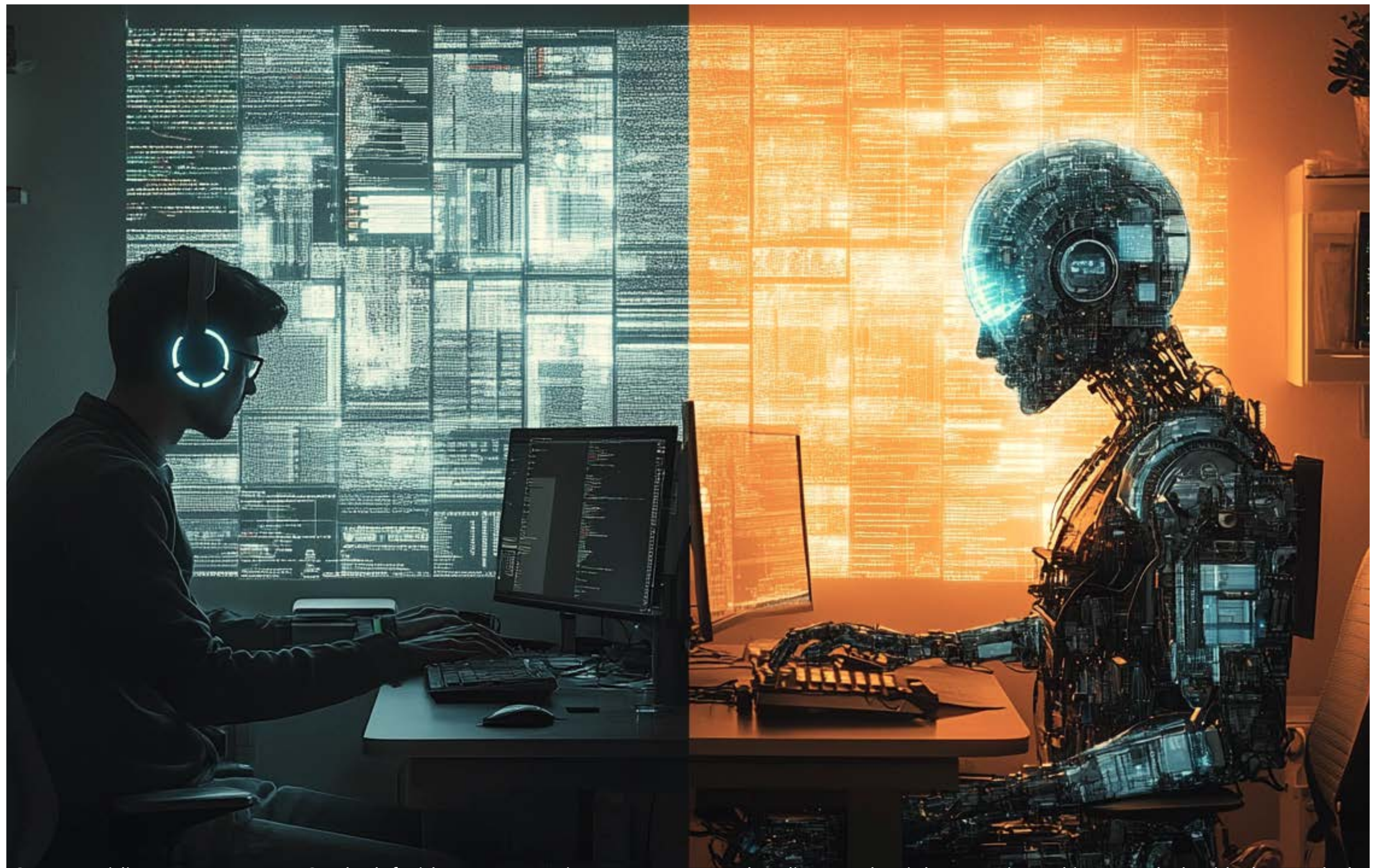
AUTHOR: FLORA D. SALIM

Flora Salim is a Professor in the School of Computer Science and Engineering (CSE) and the inaugural Cisco Chair of Digital Transport & AI, University of New South Wales (UNSW) Sydney, and the Deputy Director (Engagement) of UNSW AI Institute. Her research is on generalisable and data-efficient machine learning for multimodal spatio-temporal learning tasks. She is a member of the Australian Research Council (ARC) College of Experts. She currently serves as an Editor of IMWUT, Associate Editor of ACM TSAS, and an Associate Editor-in-Chief of IEEE Pervasive Computing, and an Area Chair for many conferences including NeurIPS, ICLR, and The Web Conf (WWW). She has worked with many industry and government partners, and managed large-scale research and innovation projects, leading to several patents and deployed systems.

Artificial intelligence (AI) is reshaping the design, planning, and operations of mobility and transport infrastructure and services that enable effective and efficient movement of people and goods. These AI algorithms are underpinned by big spatio-temporal data collected from various sources, such as sensors, cameras, smartphones, WiFi networks, and social media. These innovations not only promise reduced congestion and emissions but also offer new possibilities for novel mobility services like personalised transit solutions. However, this also demand ***responsible AI principles*** to be applied across the board, especially as the increasing automation in operational and decison making systems can bring forth both benefits and risks. The latter may lead to harms and unintended consequences, particularly when ethical principles and guardrails are not properly considered. The growth of AI in transport is fueled by data, particularly spatio-temporal and mobility data, which have been very instrumental for developing predictive models in not only the transportation and mobility domain. The research community of mobility data science [5] is an interdisciplinary field that uses scientific methods, processes, algorithms and systems to extrapolate knowledge and insights from potentially noisy, structured and unstructured mobility data, and apply knowledge from mobility data across a broad range of application domains, such as traffic and urban areas, indoor and building environments, health informatics and public health, to human and social studies.

To this end, it is important that the key ethical AI principles, that are majorly observed by the international community and institutions globally when introducing AI ethics framework [2], to be observed also for the mobility and transportation domain. These five ethical principles are ***transparency, justice and fairness, non-maleficence, responsibility, and privacy*** [2]. These principles require socio-technical and interdisciplinary lens. For the purpose of this short perspective article, I will focus only on the technical side of these principles. Indeed, spatio-temporal data is special and more challenging to deal with given its heterogeneity and dynamic nature [6, 7, 12]. Further, modelling with spatiotemporal data is often hampered by the dynamic nature of the data and data sparsity. Technical approaches developed for transparency, including accountability and XAI tools and framework, fairness, and privacy are not always directly applicable, as they are developed mostly for image datasets which are static and well-labelled. When a traffic pattern does not follow a typical bell curve of the off-peak hours, or when a sequential trajectory pattern cannot be classified into a specific transportation mode to understand mode shift in a MAAS network, often the required label data useful for validation is non-existent. Further, due to population growth and major development, and behaviour changes (e.g. post COVID travel behaviours), data distribution shifts may occur, which render models trained with prior knowledge to be outdated or even obsolete. To address the limited training data problem, novel self-supervised learning for time-series, spatio-temporal, and sequential data have been introduced recently [1, 7].

These five ethical principles are transparency, justice and fairness, non-maleficence, responsibility, and privacy.

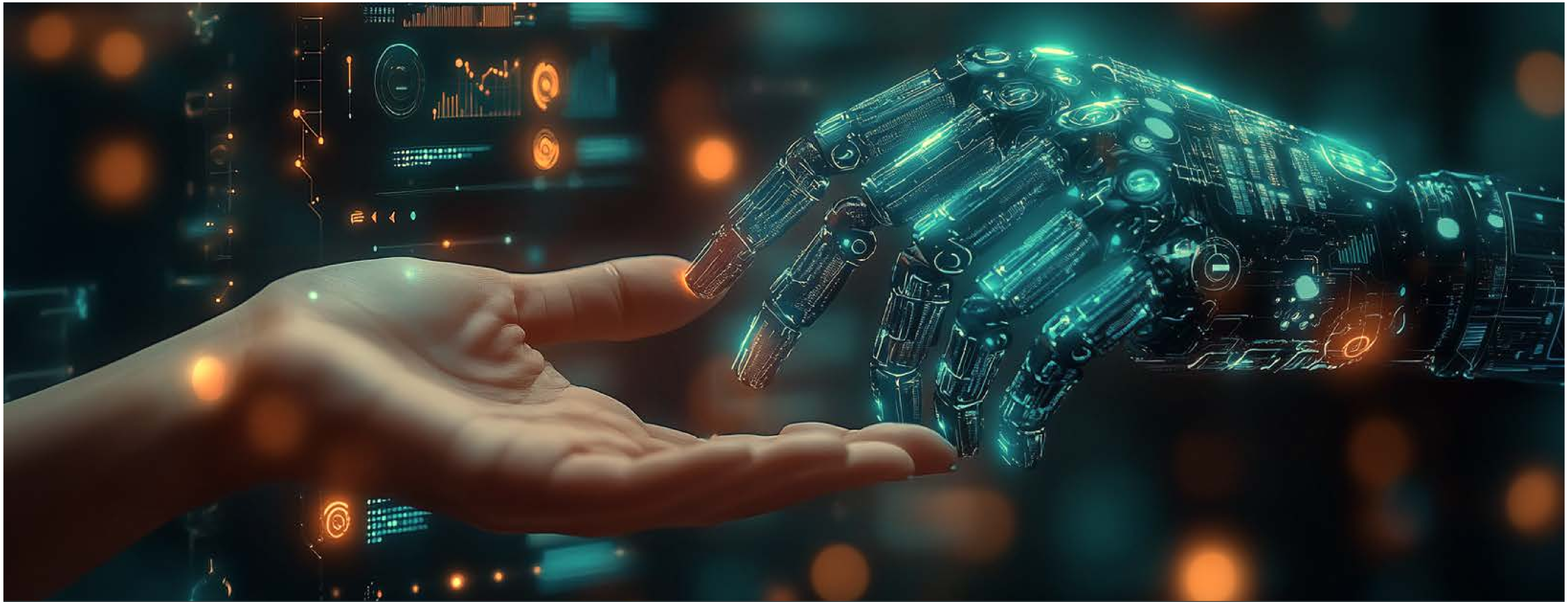


Source: Midjourney; Prompt = On the left side, a person using a computer and coding. on the right, an AI is working at a desk with data. Include visual cues of data, AI algorithms, and transport elements

This is fundamental and essential given that transparency, explainability, and interpretability of data-driven AI models for transportation and mobility need to be robust [13] and faithful to the underlying representations across decision boundaries [11], while remain robustly fair and unbiased [9].

Bias and fairness mitigation in mobility, transportation, and urban computing domain is challenging, as it does not only have to deal with the competing priorities of ensuring individual vs. group fairness [10], but also the multi-sided

To address the limited training data problem, novel self-supervised learning for time-series, spatio-temporal, and sequential data have been introduced recently.



Source: Midjourney; Prompt = a human hand and a robotic hand working together on a digital interface, surrounded by data icons, data, data visualizations and infographics, highly detailed

stakeholders, such as visitors and service providers, e.g. of Places of Interests(POIs) [8], or transport platform vs users [4], or the two-sided markets of ride-hailing markets [3].
This is why responsible AI research for mobility and transportation is still very much an open problem require an interdisciplinary community effort, to ensure both the beneficence and non-maleficence of AI research and development in this important domain.

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Multiple Discrete Continuous Choice Models with Flexibility in Specification of Constraints, Utility Functions, and Stochastic Specifications: Applications to Travel Behaviour Research

Analysing individuals' choices and preferences have always been integral to travel behaviour research. In this regard, econometric choice models have been widely used to understand and characterise these preferences. Much focus in this domain has been on analysing single discrete choices (such as individuals' mode choice decisions, route choice decisions, etc. with multinomial logit (MNL) being its typical workhorse). However, several choice situations are often characterised by complex choice environments where individuals can potentially choose multiple alternatives along with the extent of choice. These choice situations are referred to as multiple discrete-continuous (MDC) choices and are quite ubiquitous in travel behaviour research (for example, individuals' Analysing individuals' choices and preferences have always been integral to travel behaviour research. In this regard, econometric choice models have been widely used to understand and characterise these preferences. Much focus in this domain has been on analysing single discrete choices (such as individuals' mode choice decisions, route choice decisions, etc. with multinomial logit (MNL) being its typical workhorse). However, several choice situations are often characterised by complex choice environments where individuals can potentially choose multiple alternatives along with the extent of choice. These choice situations are referred to as multiple discrete-continuous (MDC) choices and are quite ubiquitous in travel behaviour research (for example, individuals' daily activity participation and time allocation, where individuals can potentially allocate time to multiple activities).

The above introduction to MDC models sounds common (even somewhat formulaic – my own articles included!). Ironically, the MDC models are completely opposite – amazingly fascinating

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Shobhit Saxena earned his PhD from the Indian Institute of Science, Bengaluru, in 2022, specializing in econometric approaches and choice modelling, with a focus on multiple discrete-continuous choices to analyse various aspects of travel behaviour. After completing his doctoral studies, he worked as a Research Scientist at the Center for Infrastructure, Sustainable Transportation, and Urban Planning (CiSTUP) at IISc and the Center for Transportation Research (CTR) at the University of Texas at Austin. Currently, he is a research fellow at Leeds University Business School, University of Leeds, UK. His research interests include understanding various facets of travel behaviour, including activity time use, tourism travel expenditure, transport equity, and safety. He is also interested in exploring supply-demand interactions in shared mobility alternatives.

Source: Midjourney; Prompt = An illustration of a professor who is writing complex equations on a board and drawing data diagrams and graphs while thinking about bus, train, car, and bike in a city once you go down the thick of things. The multiple discreteness in the choice process coupled with the additional consumption dimension governed with an overall budget, all within a single model, seems overly complex. However, all these intricacies are encapsulated so beautifully in the simple, MNL-like closed-form likelihood expression – it is indeed a work of art. Of course, this elegance is a culmination of years of research, beginning with the seminal works of Deaton and Muelbauer (1980), Wales and Woodland (1983), Hanemann (1984) et al. that laid the foundations of MDC choice models. However, complex estimation routines coupled with a lack of computing infrastructure led to very few real-world applications of these models in the early decades. Building upon this research, Bhat (2005; 2008) developed the multiple discrete-continuous extreme value (MDCEV) model. This groundbreaking work in analysing MDC choice situation was one of the best research papers that I had come across, not to mention the wonderful writing in the paper which made such complex notions so easy to understand (particularly to someone who knew nothing about the field at the time).

My contributions

Bhat's MDCEV model, due to its simple structure, was very widely used to analyse various facets of travel behavior, including time use decisions (which form the backbone of most activity-based models of travel demand). In the context of activity participation and time-use decisions, MDC models became a natural contender to be deployed as "activity-generators". With such increased applications, several important methodological advancements in modeling MDC choices happened in the last decade. Despite these advances, there were several shortcomings in MDC models (of time-use and beyond). For instance, time-use decisions are often governed with a lot of contextual constraints which lead to most activities undertaken across multiple episodes within a day. However, such resource (time) allocation across multiple episodes was disregarded in the earlier MDC models. In fact, despite the advanced MDC models being sophisticated enough to incorporate multiple constraints (such as time and money constraints), they could not accommodate logical/contextual constraints (such as the logical occurrence of multiple episodes and/or activities or bounds on time allocation across multiple episodes/activities). To this end, we explored approaches to incorporate these contextual/logical constraints within the MDC model structures and were able to accommodate time allocation across multiple episodes and impose bounds on time allocation across these episodes of activities. These advances are particularly useful in microsimulation applications of these models (such as activity-based travel demand model).

Going beyond the specification of constraints, we explored alternative utility profiles used in MDC model structures. Importantly, these explorations improved our understanding of the recently developed MDC models with flexible utility profiles. One such important piece was the use of MDC models with "linear outside good" profile in situations when the total budget is unknown. Through our work, we provided a much-needed course correction, with an improved understanding that these models are useful only in situations when the total budget is very large relative to the allocation to alternatives of interest (aka, the inside goods). For such situations, we derived the distribution of optimal demand resulting from the MDC models with very large budgets, thus obviating the need for simulations when forecasting using these models. In addition, we also explored different stochastic specifications of utility functions. These explorations, in addition to increasing flexibility through a general covariance matrix, improved our understanding that using thick-tailed distributions (such as the typically used type I extreme-value distribution) may lead to infinite moments of the resulting optimal demand, thus rendering the model useless.

In addition to the above methodological developments, we explored several datasets from India and beyond. Notably, the empirical findings from the Indian time-use and tourism expenditure analysis were important additions to the literature, since only a handful of such studies exist in the travel behavior research community.

Source: Midjourney; Prompt = A professor thinking about bus, train, car, and bike in a city + simple background + minimalist + green blue colors + realistic

What lies ahead?

No research is complete in absolution. There are several interesting research directions, some longstanding issues, and a few new threads that emerged from our work. One such direction that I am really excited about is the treatment of travel time in time-use models. There are several longstanding issues when it comes to the treatment of travel time in time-use models – does it impart any utility (or perhaps disutility)? Is it the cost of undertaking an out-of-home activity? Does it form part of the time-budget? These questions are not explored, possibly because of unresolved methodological challenges associated with incorporating travel time within the utility maximisation framework. However, with the recent advances in two-stage MDC models (that endogenously estimates the budget) along with the approaches developed in our research to accommodate contextual/logical constraints, exploring approaches to treat travel time in a utility-consistent (and logical) way is an exciting research direction. Of course, this is just one of the many research threads (and particularly the one that I am excited about) in this relatively nascent field of research.

Accountability in AI-Driven Urban Transportation:

A Multi-Criteria Decision Analysis Framework for Ethical and Legal Responsibility Allocation

AUTHOR: Mohammad Yazdizadeh

Mohammad Yazdizadeh is a researcher in the Department of Transportation Engineering at Isfahan University of Technology, Isfahan, Iran. He earned his Master's degree in Transportation Engineering; additionally, he specialized in traffic flow dynamics and intelligent transportation systems. His research focuses on traffic modelling, simulation, and the integration of autonomous vehicles into urban traffic environments.

Summary: when it comes to determining liability for accidents or failures, AI-powered transportation systems face ethical and legal challenges. A new approach employs Multi-Criteria Decision Analysis (MCDA) to assess accountability by evaluating factors like control, risk, compliance, and preventive measures among various stakeholders for ethical responsibility.

Introduction: Transportation has been greatly impacted by artificial intelligence through innovations such as autonomous vehicles and smart technology. Nevertheless, with AI becoming more prominent in decision-making, it also brings about important ethical and legal issues, especially in the event of accidents. This raises an important issue: Who is responsible for AI system failures? Is it the AI developers, manufacturers, transport authorities, or end-users? Although several studies [1], [2], [3] have explored the ethical aspects of AVs, they frequently do not provide practical solutions for responsibility in AI-driven transportation. Using Multi-Criteria Decision Analysis (MCDA) [4], a methodical way to assess the involvement of different stakeholders in AI-related accidents is proposed.

Methodology: The proposed framework outlines the methodology by demonstrating how it can be applied to Waymo's Autonomous Vehicle (AV) system as a case study to evaluate the roles and responsibilities of key stakeholders. Assessing control, risk introduction, regulatory compliance, and preventive measures, responsibility for the success and risks of the AV system is assigned systematically.

1. Key Stakeholders

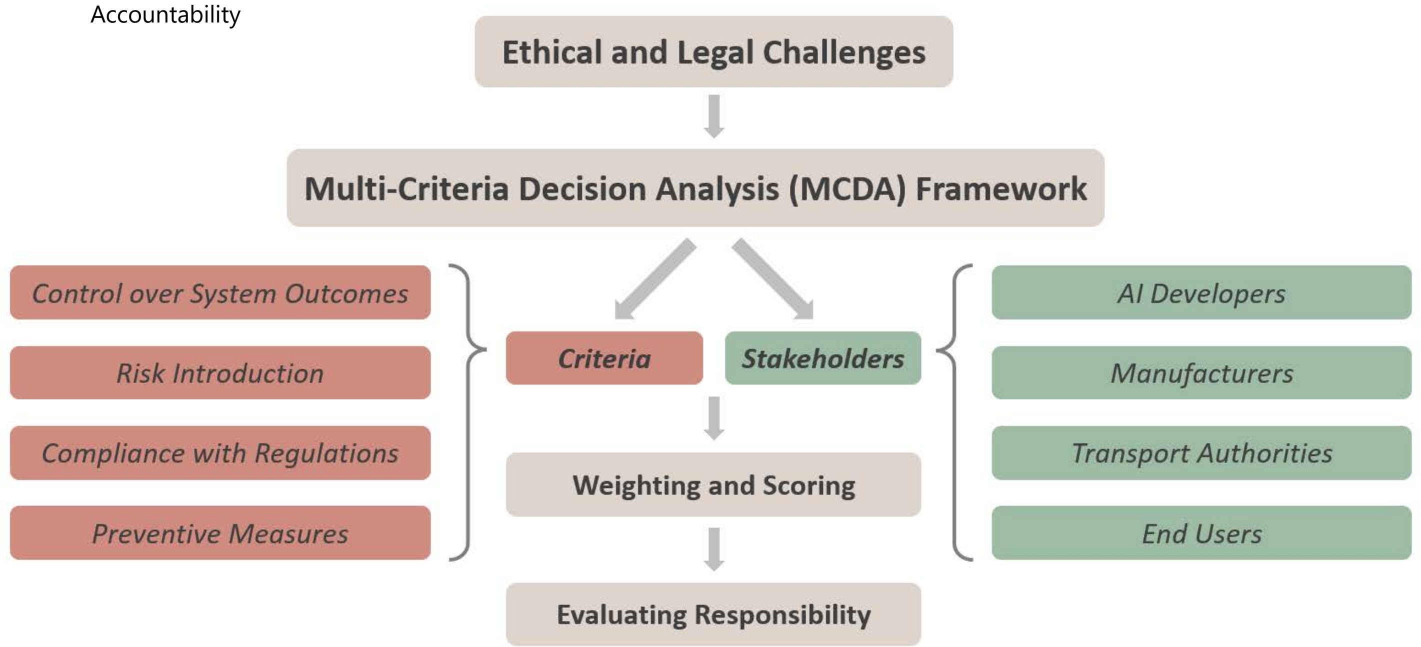
- ***AI Developers (Waymo):*** Develop and manage AI algorithms that govern vehicle decision-making.
- ***Vehicle Manufacturers:*** Provide and maintain essential hardware (sensors, cameras, LiDAR) for environmental perception.
- ***Regulatory Authorities:*** Ensure legal and safety compliance, set standards for AV operation, and enforce traffic regulations.
- ***End Users (Passengers and Pedestrians):*** Individuals who interact with AVs, either as passengers or pedestrians.

2. Assessment Criteria and Weighting

Stakeholders are evaluated across four key criteria, each weighted according to its importance to the success of the AV system[1]:

- ***Control over System Outcomes (40%):*** How much influence each stakeholder has over AV performance and decision-making.
- ***Risk Introduction (30%):*** The degree to which each stakeholder contributes to potential risks in the system.
- ***Compliance with Regulations (20%):*** How well each stakeholder ensures adherence to safety, legal, and operational standards.
- ***Preventive Measures (10%):*** Steps taken by each stakeholder to mitigate risks and prevent system failures.

Figure. AI and Urban Transportation Accountability



Source: Midjourney; Prompt = a scale held at the left end by a robotic hand and at the right end by a human hand + green and blue background colors + transport elements

3. Weighted Scoring Calculation and Responsibility Allocation

Each stakeholder's contribution is scored on a scale of 100 for each criterion. The percentage values assigned to stakeholders for each criterion are approximate estimates, reflecting their level of influence or contribution to that aspect of the system. These raw percentage contributions are then weighted according to the importance of each criterion and combined to calculate an overall responsibility score. The score for each criterion is determined using the formula:

Score = Criteria Weight × Stakeholder Contribution. Table on the next page shows the calculated scores for each criterion in parentheses. Ultimately, each stakeholder's total responsibility is expressed as a percentage of their total weighted score divided by the sum of all stakeholders' scores.

This framework highlights the significant roles of AI Developers (Waymo) and Vehicle Manufacturers in ensuring the safe and reliable operation of autonomous vehicles. AI Developers hold the highest responsibility due to their control over decision-making algorithms and the risks of potential errors. Vehicle manufacturers have

Table. Assessment Criteria

Criteria	AI Developers (Waymo)	Vehicle Manufacturers	Regulatory Authorities	End Users (Passengers and Pedestrians)
Control over System Outcomes (Weight 40%)	90% control over AI algorithms and decision-making. (36)	80% control over hardware performance (sensors, cameras). (32)	50% control through policy enforcement and compliance. (20)	5% control through interactions with AVs. (2)
Risk Introduction (Weight 30%)	60% risk from algorithm errors and decision failures. (18)	60% risk from hardware malfunctions. (18)	15% risk from regulatory gaps or delays. (4.5)	5% risk from improper use or interaction. (1.5)
Compliance with Regulations (Weight 20%)	85% compliance with AI-related standards and regulations. (17)	90% compliance with hardware manufacturing standards. (18)	100% compliance with traffic laws and AV regulations. (20)	95% compliance with road rules and safety protocols. (19)
Preventive Measures (Weight10%)	90% through testing, validation, and continuous monitoring. (9)	75% through quality checks and hardware maintenance. (7.5)	70% via regulatory trials, safety testing, and regulations. (7)	50% through education and safety awareness campaigns. (5)
Score	80	75.5	51.5	27.5
Sum Scores	234.5			
Responsibility (%)	34.11%	32.20%	21.97%	11.72%

substantial responsibility for controlling essential hardware like sensors and cameras. Regulatory authorities ensure safety standards and legal compliance through enforcement, while end users play a smaller but important role in interacting safely with AVs. To refine accountability, future research should explore cooperative accountability models, global adaptability, and dynamic legal systems.

[1] **Justification for the weights:** *these values reflect a hierarchy of influence on system accountability. In assigning weights to different criteria for accountability, control over system outcomes is given the highest priority at 40% because it represents the most direct ability to prevent harm and manage outcomes. This focus on control recognizes that stakeholders who have the capacity to intervene or influence outcomes bear the greatest responsibility in ensuring system safety. Risk introduction follows with a 30% weight. This acknowledges that while control is paramount, the risks each stakeholder introduces play a substantial role in shaping overall accountability. Stakeholders who introduce greater risks into the system are assigned more responsibility because of the potential impact of those risks.*
The remaining criteria, compliance and preventive measures, are weighted at 20% and 10%, respectively. Compliance is viewed as a baseline requirement for all stakeholders, critical but less impactful on direct outcomes than control or risk. Preventive measures, though important for enhancing safety, have a more indirect effect on accountability and therefore receive the lowest weight. This hierarchy emphasizes direct influence and risk contribution while accounting for foundational responsibilities. These weights can be adapted based on specific circumstances and evolving needs in AI-driven transportation systems.

Source: Midjourney; Prompt = Letters 'AI' designed as a city, with intricate urban details inside the letters. The interiors feature roads, buildings, parks, cars and buses seamlessly integrated + vibrant + modern + highly detailed + city within the shapes of 'A' and 'I'

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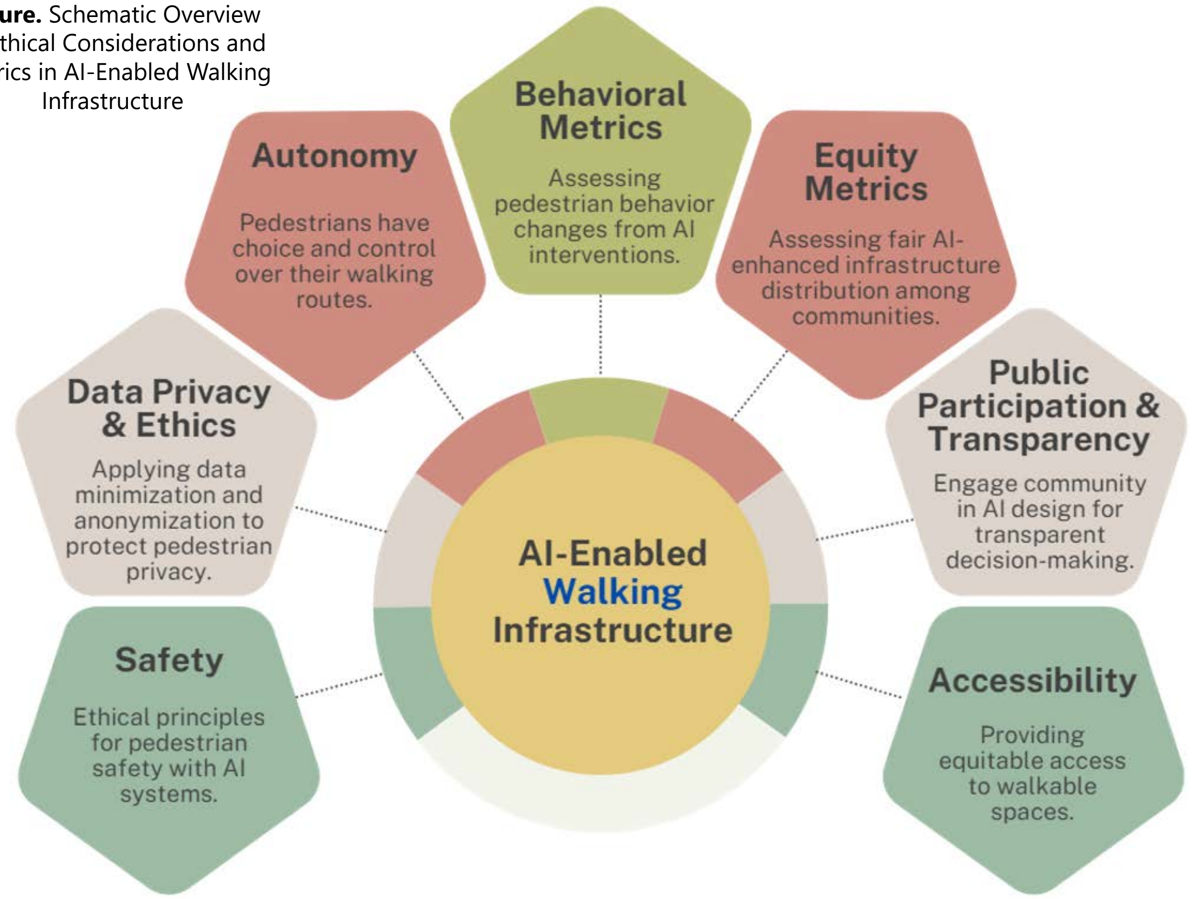
Ethics on Foot:
Balancing Technology and Human Values in AI-Driven Transport Systems

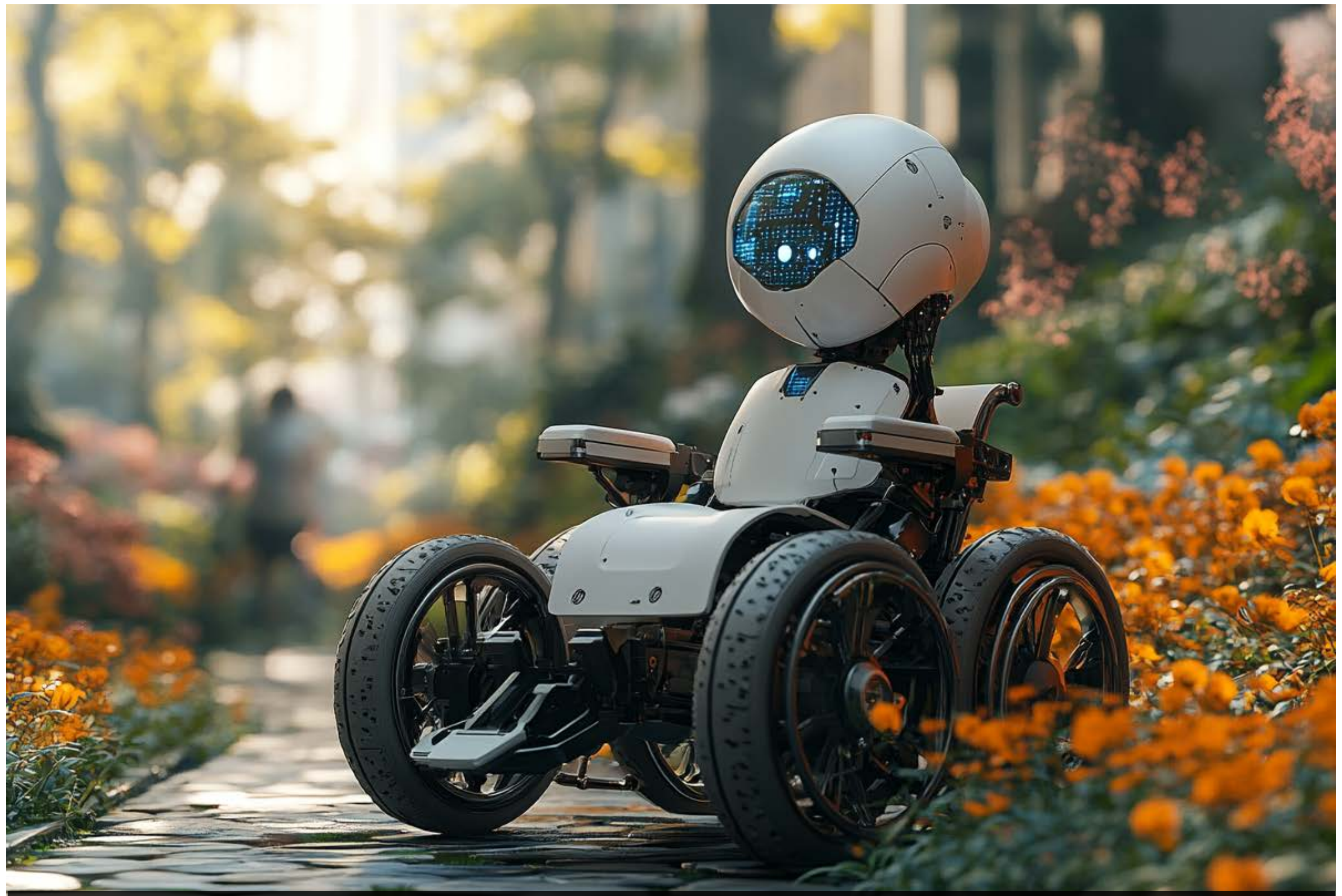
AUTHOR: Amir Rafe

Amir Rafe is a Transportation Engineer and a PhD candidate in Civil and Environmental Engineering at Utah State University. Amir has contributed to numerous international projects, including traffic engineering, crowd evacuation, and management studies. His current work focuses on developing an AI-driven framework, EvacuAIDi, aimed at improving the safety of emergency evacuations for individuals with disabilities, including those with mobility, visual, and hearing impairments.

In an era of rapid technological advancement, integrating artificial intelligence (AI) into urban transport systems presents opportunities and challenges for walking as a mode of transportation. As cities use technology to promote sustainable living, the ethical design of AI-enabled walking infrastructure becomes crucial. This discussion emphasizes the need to balance technological innovation with human values and pedestrian well-being, setting the stage for exploring ethical frameworks that can guide this integration.

Figure. Schematic Overview of Ethical Considerations and Metrics in AI-Enabled Walking Infrastructure





Source: Midjourney; Prompt = A wheelchair powered with artificial intelligence in a green city

Ethical Frameworks for Pedestrian-Centric Design

To ethically integrate AI into pedestrian infrastructure, we must consider foundational ethical principles. The design of walking infrastructure should prioritize pedestrian safety, accessibility, and autonomy, guided by these ethical principles.

Consequentialist ethics (1) encourage consideration of long-term impacts, such as how future AI systems might optimize traffic signals to prioritize pedestrian safety, potentially increasing walking rates and improving community health.

Deontological ethics (2), focused on the inherent rightness of actions, can guide AI-powered urban planning tools to ensure equitable distribution of walkable spaces across neighborhoods. Although current AI implementations in pedestrian infrastructure are limited, these ethical frameworks provide a foundation for future developments, ensuring that innovations prioritize human values. Building on this foundation requires quantifying responsibility within AI systems to uphold these ethical standards.

Quantifying Responsibility in Pedestrian Infrastructure

Quantifying responsibility is crucial as AI systems increasingly influence walking environments. Frameworks for doing so are essential to ensure accountability in these evolving systems. The Responsibility-Sensitive Safety (RSS) model (3), originally for autonomous vehicles, can be adapted for pedestrian infrastructure, defining rules for AI systems managing crossings or shared spaces. This model ensures clear responsibility among AI developers, urban planners, and pedestrians.

Metrics to assess AI's impact on walking behavior might include:

- ***Behavioral and Safety Metrics:*** Changes in walking frequency, safety indices, and crash rates.
- ***Equity Metrics:*** The fair distribution of pedestrian infrastructure across communities.

These metrics help quantify the ethical performance of AI systems in promoting walking as the fundamental transport mode. However, effectively encouraging walking also demands insights from behavioral sciences.

Interdisciplinary Insights for Walking Behavior

Integrating insights from behavioral economics and environmental psychology can enhance the design of AI systems that promote walking. AI-powered apps might suggest walking routes optimizing efficiency and points of interest while ensuring ethical nudges respect user autonomy. Additionally, AI systems trained in urban design principles and pedestrian perceptions can design appealing walking paths that enhance psychological comfort through features like shade and aesthetics.

Social justice theories guide the equitable distribution of AI-enhanced infrastructure. AI can analyze novel sources of pedestrian data (4–6) to identify underserved areas, ensuring the benefits of walkability are fairly distributed across socioeconomic boundaries. To support these efforts, transparency and explainability in AI systems become crucial.

Transparency and Explainability in Pedestrian AI

Transparency is paramount as AI shapes walking environments, reinforcing trust and facilitating public engagement. Pedestrians should receive clear explanations of how AI influences their experience, especially in crowded areas or evacuation scenarios. Public participation in AI system design enhances transparency and trust, aligning AI objectives with community values. Explainable AI (XAI) techniques, such as visual dashboards that show how AI is influencing pedestrian traffic patterns in real-time—especially in crowded areas or evacuation scenarios—can demystify the decisions made by AI systems, fostering public trust and enabling informed civic participation in the development of walking infrastructure.

AI's role in analyzing walking behavior includes collecting pedestrian data, necessitating ethical guidelines. Data minimization should be applied, collecting only what is necessary to improve infrastructure, while robust anonymization techniques protect individual privacy.

Conclusion

Ethically designing AI-enabled walking infrastructure requires balancing technological advancements with human values. By applying ethical frameworks, quantifying responsibility, integrating interdisciplinary insights, and ensuring transparency, cities can create walking environments that are efficient, safe, equitable, and respectful of autonomy. Ongoing dialogue between AI developers, urban planners, ethicists, and the public is essential to ensure that AI-enhanced infrastructure serves the needs and values of pedestrians.

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Source: Midjourney; Prompt =a green LED traffic light with a glowing green symbol of a disabled person on a wheelchair + background is a green and sustainable city + artificial inteligence

IATBR 2024 ⟶ 2027

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The *17th IATBR conference* was held on 14-18 July 2024 in ***Vienna, Austria***. The theme of the conference was "**Transformative Travel Behaviour Research - Looking beyond Back-to-Normal**". The conference had 512 participants from 42 countries, 353 presentations (from more than 600 extended abstract submissions) on 14 different topics. The papers were organised into 96 parallel sessions. During this conference 8 workshops and 2 special events were also organised. To minimize the environment impacts of this event, this conference was organised as an eco-event, which includes the promotion of public transport usage, the use of only local food ingredients, reduction of plastics usage, and measurements to reduce the energy usage throughout the event.

The attendees were welcomed with a reception at the University of Vienna's main building. The conference was officially kicked-off by a welcoming speech from the Austrian Federal Minister for Climate Protection, Environment, Energy, Mobility, Innovation, and Technology, Minister Leonore Gewessler, who highlighted the importance of the scientific community like IATBR to identifies new solutions, helps to realize the opportunities of sustainable changes in behaviour and can thus further strengthen sustainable mobility concepts.

In this conference we had five inspiring key notes from various disciplines, Prof. Em. Gerd Sammer (BOKU, Vienna), Prof. Chandra Bhat (University of Texas at Austin), Prof. Sonja Haustein (Technical University of Denmark), Prof. Mei-Po Kwan (the Chinese University of Hong Kong), and Professor Martin Raubal (ETH Zürich).

During the conference Prof. Kay Axhausen and Prof. Hani Mahmassani were awarded IATBR Lifetime Achievement Award. The announcement of the Eric Pas Award winners 2021 and 2022, Jason Hawkins and Shobhit Saxena, were also took place. During conference, a special tribute event to the late Prof. Ilan Salomon was also organised.

As a part of IATBR 2024 post-conference publications, 11 special issues have been prepared.
More detailed summary of the conference can be found in here[1] and the recordings of the keynote speakers can be found at IATBR youtube channel[2].

Thank you very much to all who have took part in IATBR 2024. Good luck to the next host, UNSW, Sydney, Australia, Prof. Taha Rashidi!

1 https://www.davemos.online/iatbr2024summary
2 https://www.youtube.com/playlist?list=PLBR3Q0pfDRt10vjYej5cWAeWncJUpeYgX

IATBR NEWS, Vol.5, January 2025

International Association for Travel Behaviour Research