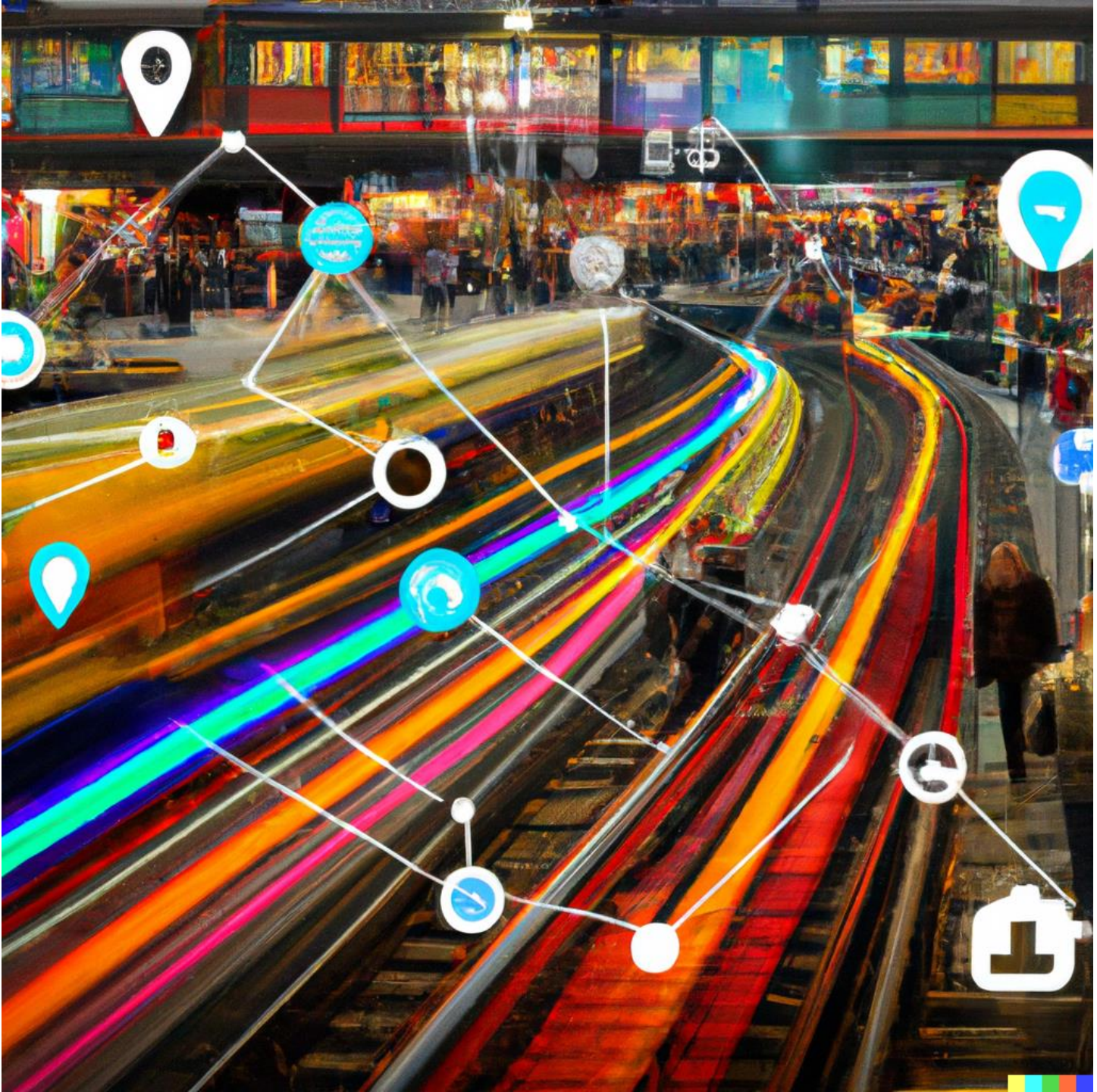


Disaggregate Behavior and Aggregate Outcomes
Session

Hani Mahmassani

Northwestern

3rd Symposium on Activity-Based Modeling

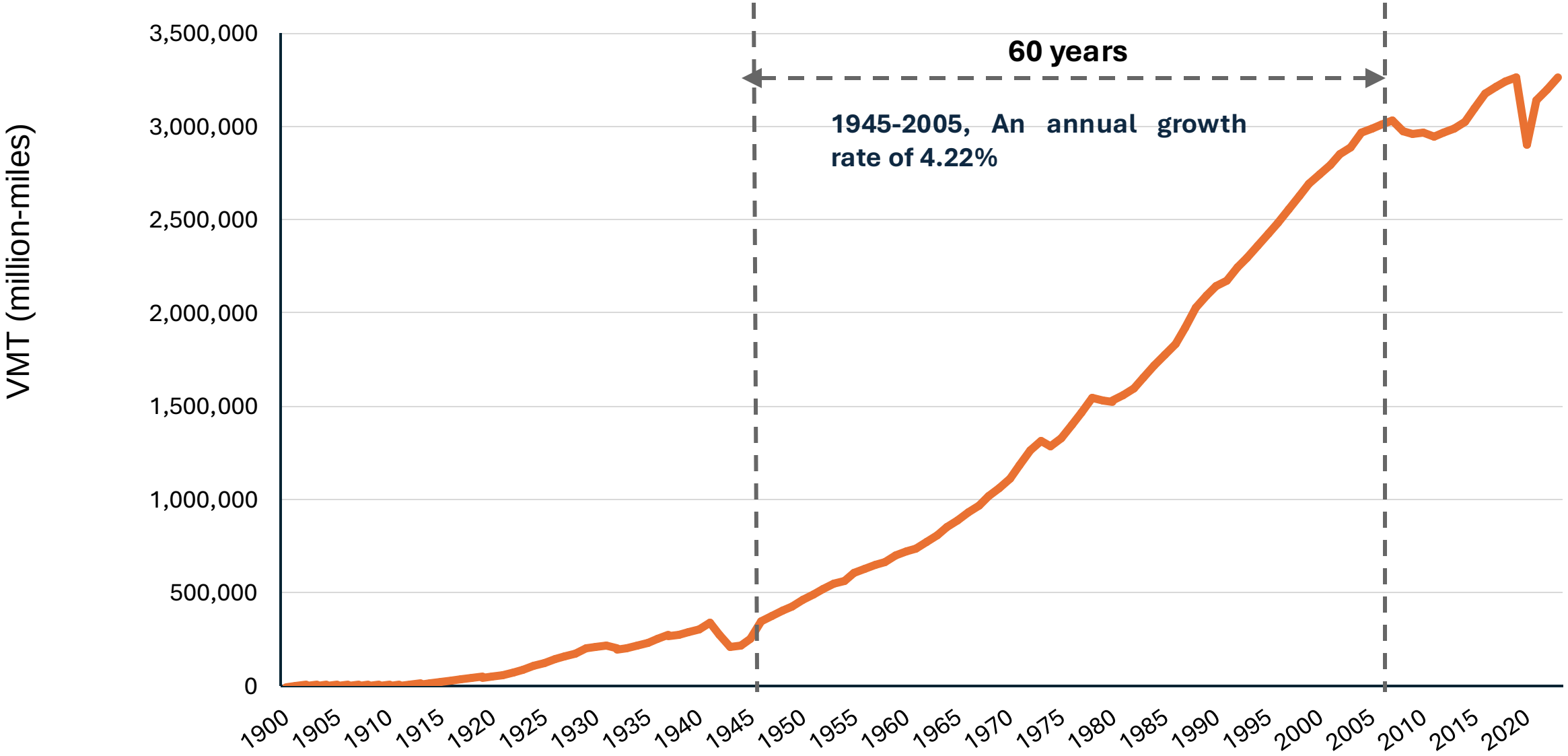
Summary of session presentations

- (Somewhat) heterogeneous session, diversity of perspectives
- But illustrated how *situational* modeling is and needs to be to address specific problems with their data limitations, and where the resolution and models need to be simplified when needed.
- Marlin Arnz gave us an example where a customized ABM was built with simplified supply side for a special-purpose application – at the intersection of energy, environment and transport.
- Patrick Singleton argued for using readily available aggregate data both in lieu of ABMs as well as a complement to ABMs. Gave a nice framing to several modeling and policy analysis questions.
- Amanda Stathopoulos focused on safety countermeasures in transit, and people's reaction to those – using a Bayesian approach that focused the discussion on both behavioral questions as well as methodological aspects.

The emerging paradigm to transportation modeling

Source: Polzin, 2024

VMT in the United States (1900 – 2023)



Value of Information in Volatile Environments

Based on conversation with Dr. Stephen Brobst, CTO, TERADATA

- Importance of *detailed* data, eg. for different geographies ("granularities")– what's true for Chicago may not be representative for Houston or Ontario, CA
- Real-time means real-time– last week's data not necessarily indicative of this or next week's challenges
- *Large volumes* of data must be accessible to decision-makers at *high levels of detail*
- In rapidly changing environments, hyper-optimized systems should give way to rapid reconfiguration
- *Data war rooms* and scenario planning to deal with rapidly unfolding situations
- A culture of data-driven decision making is a culture of *data literacy*. These are as important as the investments in the technology itself.

Motivation

- There are new classes of problems that planning and operations agencies have to (would like to/should) address
- These range from
  - Infrastructure improvements (eg. Complete Streets that integrate micromobility in the urban fabric),
  - Future of conventional public transit when on-demand mobility services that
  - How to plan for autonomous vehicles
  - Work with private sector in moving goods and deliveries
  - Decarbonize transport
  - Using transport as a tool for non-transport objectives (?)
  - How to pay for everything
  - Whatever comes up next month, next week…
  - Etc…

Motivation

- There are new communities of modelers and users with different objectives/needs than traditional urban mobility agencies; eg. Google, Delivery and logistics companies (eg. Amazon), TNCs (eg. Uber).
- Users are looking for:
  - Responsive tools
  - Rapid set up time, specification of scenarios
  - Configurability (keep what is essential, simplify the rest)
  - Use latest, up to the minute data
  - Generation of metrics relevant to problem at hand

The manifesto…

- The typical modeling cycle of

Theory-observation-calibration-application

that has formed the backbone of the past 40+ years of transportation modeling practice for both planning and operations is no longer adequate nor sufficiently responsive to the new reality of real-time data from a wide range of sensors and individual connected devices.

- The reality calls for a different approach, a continuing cycle of intelligence augmented models that

measure-integrate-update-predict-act-measure

in the application of well calibrated knowledge-based models.

Challenges

Many challenges need to be addressed—

- modeling culture
- data resolution
- computational structures
- novel AI and ML tools that synch with physics and psychology-informed models.

Challenges

Furthermore, adapting these methods to agency practices, while nudging those towards modern data-driven analytics, stands as an important challenge, and objective for the transportation and modeling research community.

In addition, and certainly not least, training the new wave of analysts and planners to develop and use these tools is a critical requirement.

Three Recent Example Applications

Bayesian rolling horizon forecasting frameworks –

1. Growth projections at county and metropolitan levels – looking ahead 3~5 years, updates annually with all new Census and data from multiple sources.
2. Truck traffic forecasting for a toll facility -- embeds DTA tool with daily traffic data; updates quarterly, looks ahead 3 to 5 years.
3. Freight activity indicator forecast – fraction of tendered freight accepted at contracted rates; goes down when supply is chasing demand, and up when capacity is tightening. Forecast horizon is 1 to 6 mos ahead; updates monthly. Granularity from national level to individual lanes (markets).

Question to Discussant

“Are we reporting the right metrics?”

Answer

“Are we reporting the right metrics?”

It depends…

It depends

On question asked

On user

On use of that information

Need to determine granularity

Geographic

Temporal

Socio-demographic

Different studies

Have different questions

Want output at different granularity

Solution: retain option to produce output at any granularity
retain time-space activity and travel trajectories.