Consistency across time, space, and vehicle allocation

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Seeon Symposium on Activity-based Models
September 11, 2022

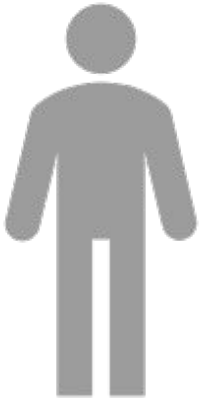
Proper Title

Problems and opportunities with consistency in time, space, and vehicle allocation in practical (i.e., used in practice by governments in support of planning studies) activity-based models (including tour-based simulation models that are commonly referred to as “activity-based”) in the United States.

Agenda

- Time
- Space
- Vehicle allocation
- Hypotheses
- Proposal

Time

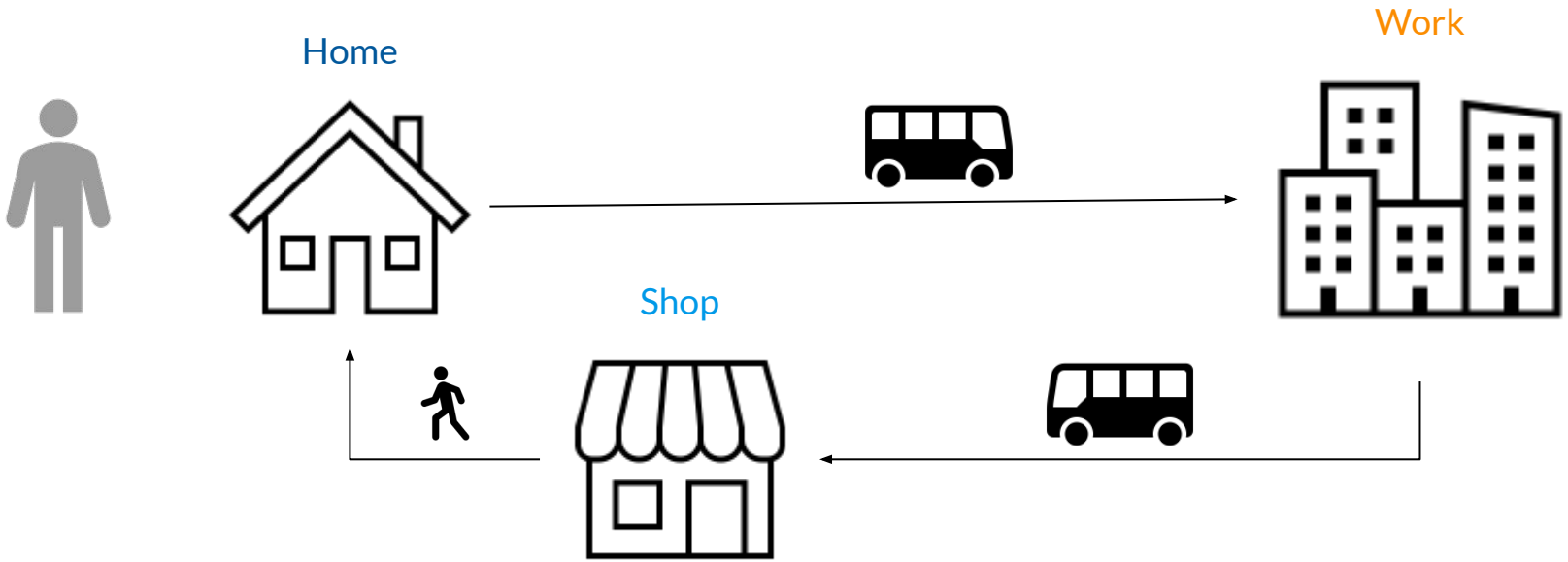


Father

Mother

Child

Car



Time

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Person	Activity	Activity Start (from ABM)	Activity End (from ABM)	Travel Mode	Network Travel Time
Father	Home	3 am	8 am	—	—
	Travel	*8 am*	*8 am*	*Transit*	*45 minutes*
	Work	9 am	5 pm	—	—
	Travel	*5 pm*	*5 pm*	*Transit*	*90 minutes*
	Shop	5 pm	5 pm	—	—
	Travel	*5 pm*	*5 pm*	*Walk*	*30 minutes*
	Home	5 pm	3 am	—	—

Time

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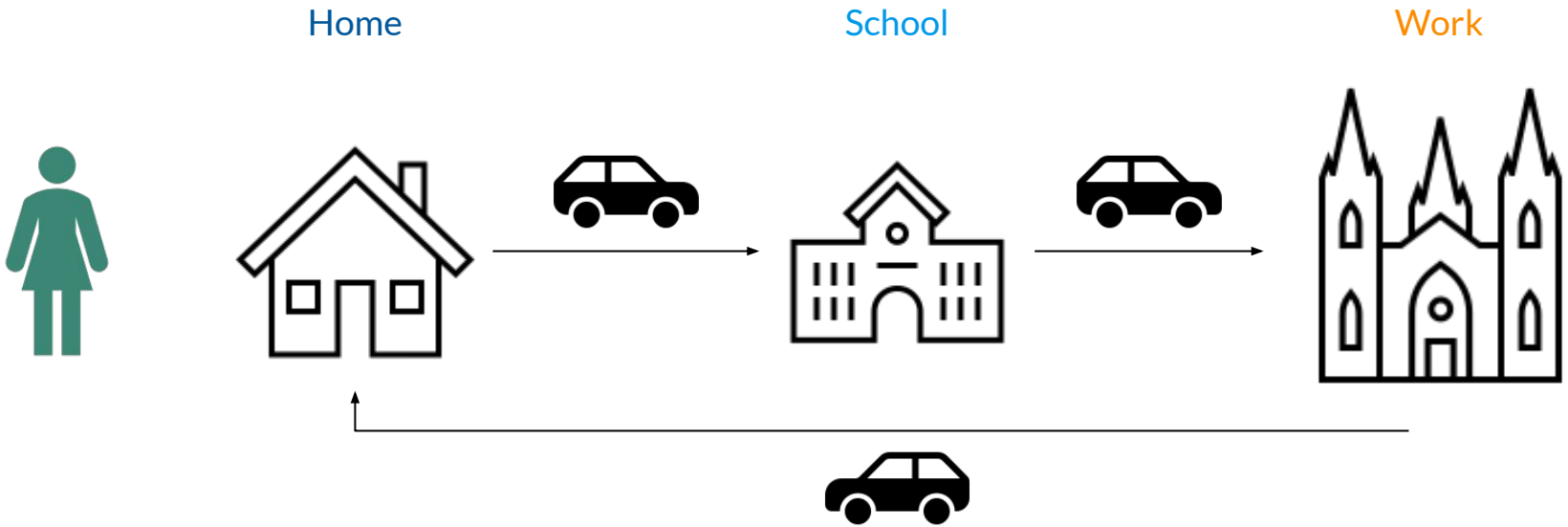
Person	Activity	Activity Start (from ABM)	Activity End (from ABM)	Travel Mode	Network Travel Time
Father	Home	3 am	8 am	—	—
	Travel	*8 am*	*8 am*	*Transit*	*45 minutes*
	Work	9 am	5 pm	—	—
	Travel	*5 pm*	*5 pm*	*Transit*	*90 minutes*
	Shop	5 pm	5 pm	—	—
	Travel	*5 pm*	*5 pm*	*Walk*	*30 minutes*
	Home	5 pm	3 am	—	—

Time

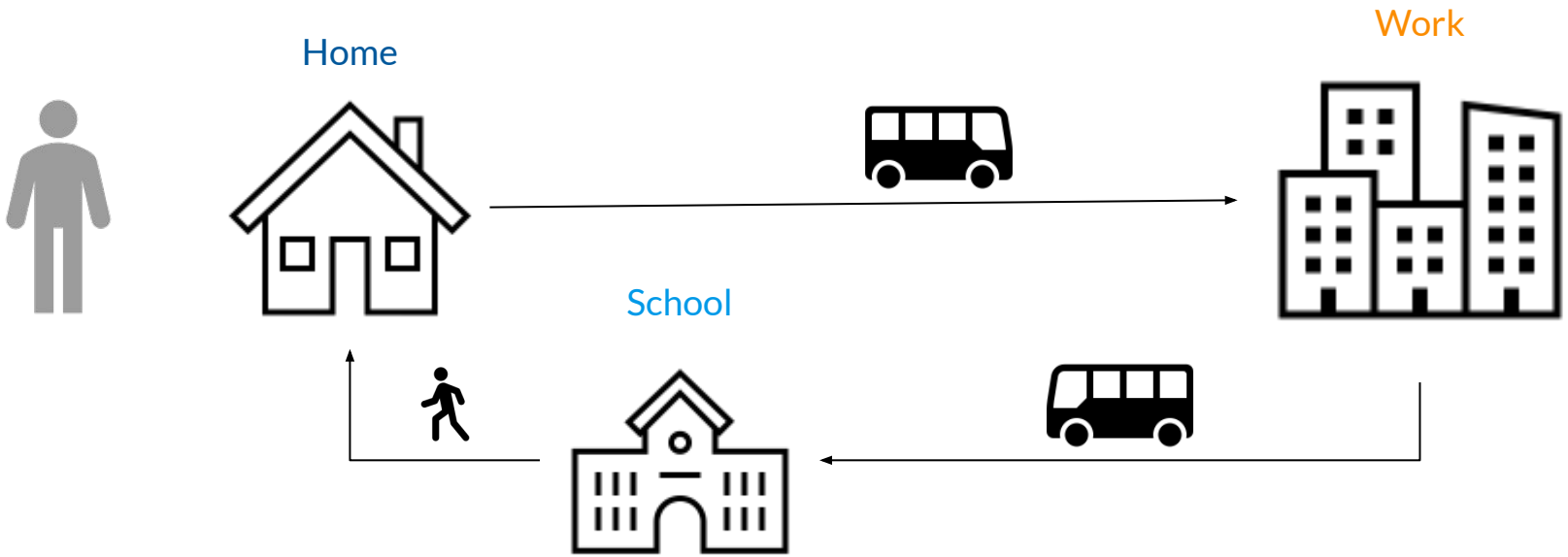
What share of a model run’s synthetic itineraries cannot be completed when considering simulated travel time?

Time

Space



Space



Space

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Person	Activity	Activity Start (from ABM)	Activity End (from ABM)	Travel Mode	Network Travel Time
Child	Home	3 am	8 am	—	—
	Travel	*8 am*	*8 am*	*Shared Ride*	*7 minutes*
	School	9 am	3 pm	—	—
	Travel	*3 pm*	*3 pm*	*Walk*	*2 minutes*
	After care	3 pm	5 pm	—	—
	Travel	*5 pm*	*5 pm*	*Walk*	*30 minutes*
	Home	5 pm	3 am	—	—

Space

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Person	Activity	Activity Start (from ABM)	Activity End (from ABM)	Travel Mode	Network Travel Time
Mother	Home	3 am	8 am	—	—
	Travel	*8 am*	*8 am*	*Shared Ride*	*7 minutes*
	Chauffeur Stop	8 am	8 am	—	—
	Travel	*8 am*	*8 am*	*Drive Alone*	*20 minutes*
	Work	9 pm	5 pm	—	—
	Travel	*5 pm*	*5 pm*	*Drive Alone*	*20 minutes*
	Home	5 pm	3 am	—	—

Space

Does the Mother make a stop on the inbound leg of her work tour at the same ***place*** as the Child's school?

Does the Father make a stop on the outbound leg of his work tour at the same ***place*** as the Child's school?

Does the Mother make a stop on the inbound leg of her work tour at the same ***time*** as the Child's school trip?

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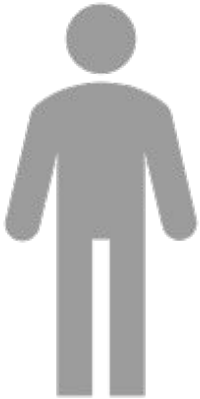
Vehicle Allocation



Father

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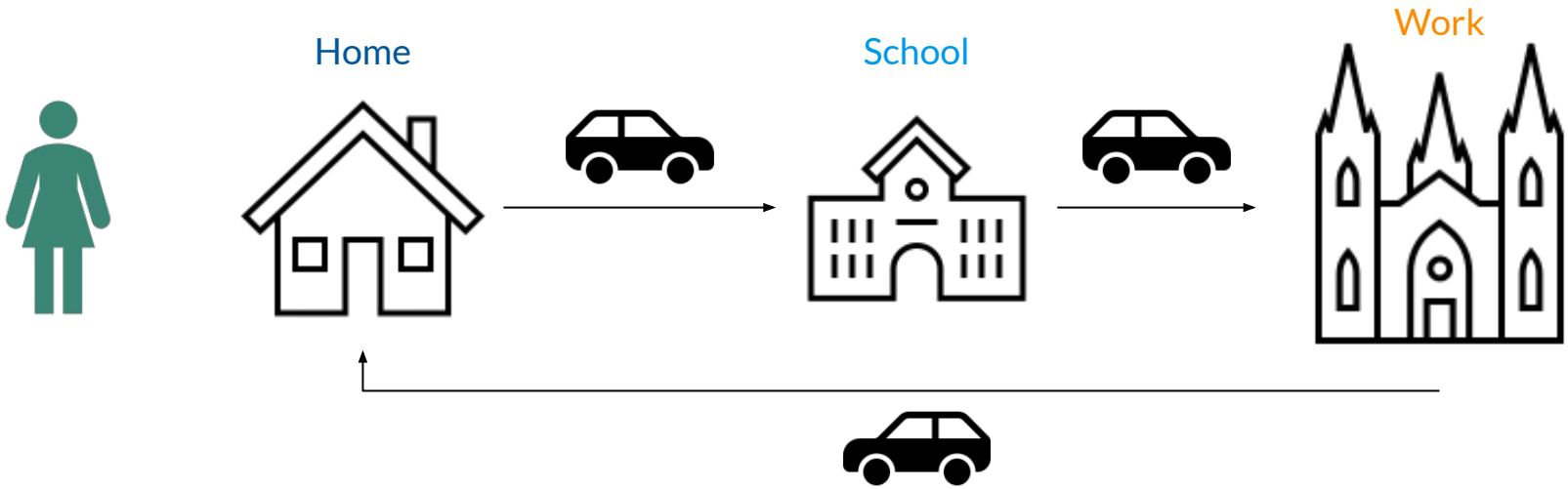
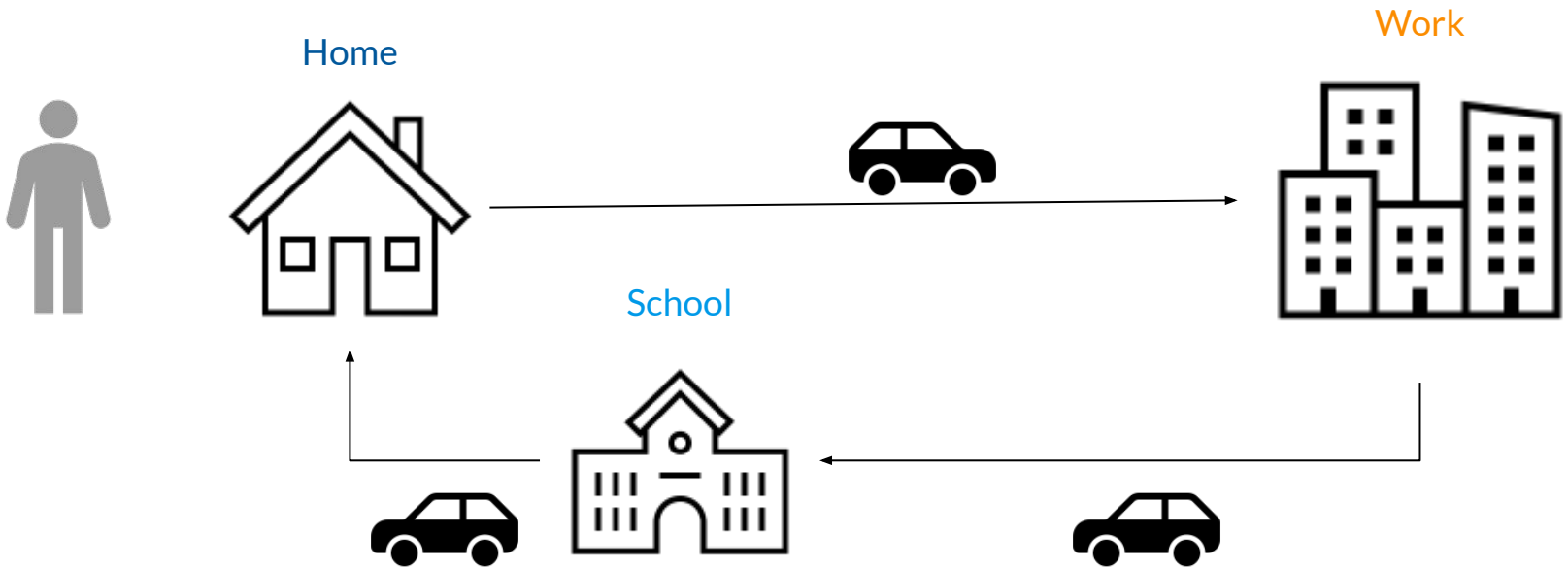


Space

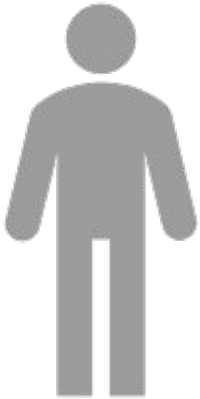


Space

Is the simulated family’s single car in two different places at the same time?

Vehicle Allocation

Hypotheses



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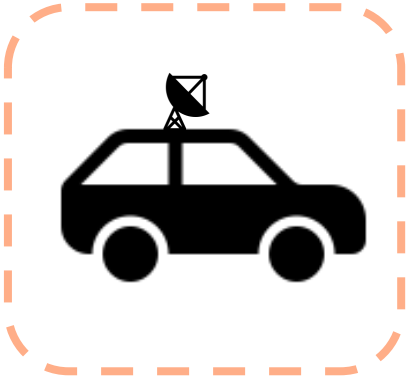

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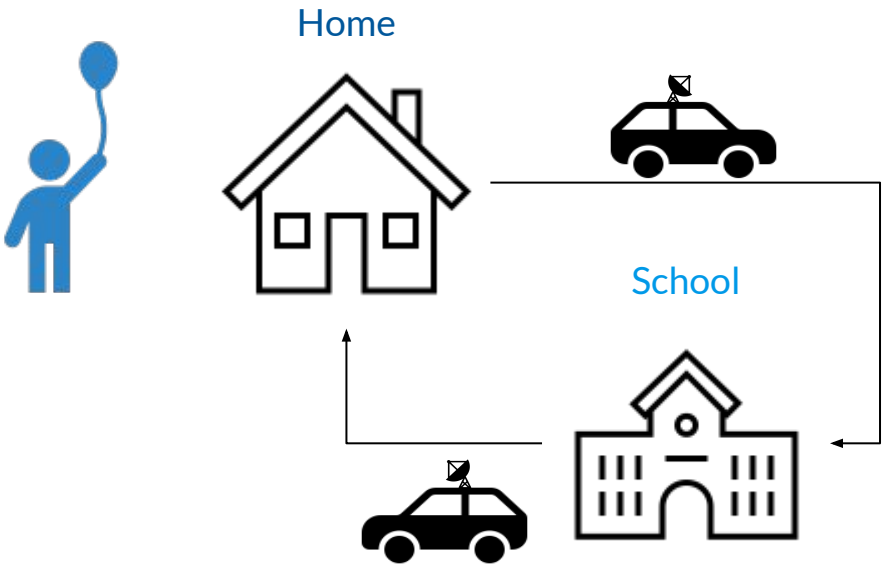
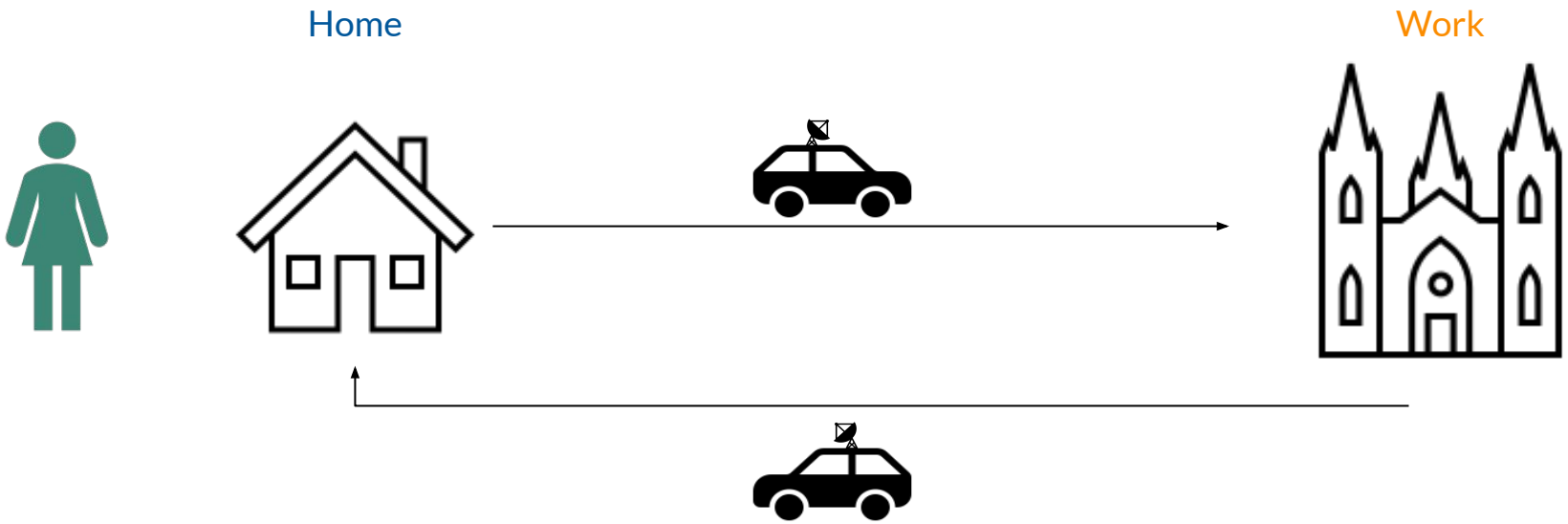


Automated vehicles



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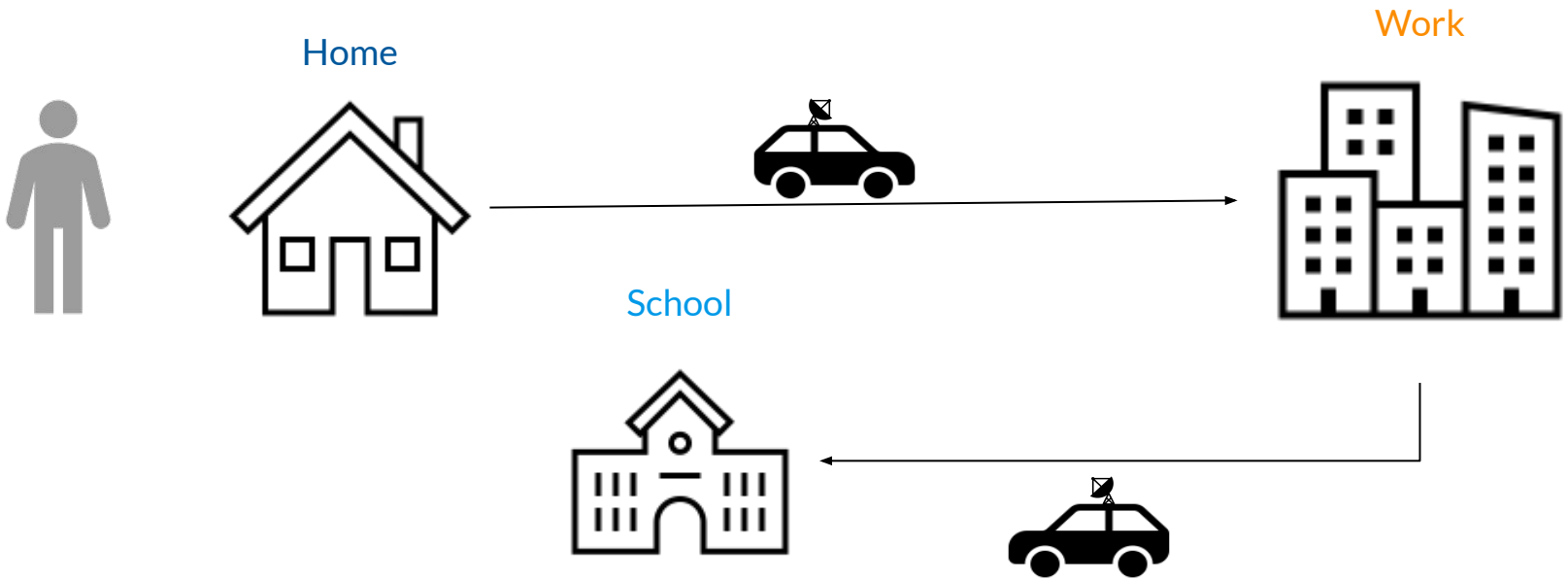

Automated vehicles

Relief from chauffeuring duties and mobility constraints provided by personally-owned automobile sharing will be a key benefit — perhaps second only to reduced accidents — of vehicle automation.

Key Hypothesis #1

Relief from chauffeuring duties and mobility constraints due to personally-owned automobile sharing will be a key outcome of vehicle automation.

This hypothesis has important implications for **social equity** and **policy**, i.e., should automated vehicles be subsidized for low income families? Single parents?

Key Hypothesis #1

We can only estimate the benefits (e.g., a broader range of employment options and schedules) from relieving chauffeuring responsibilities and mobility constraints if we represent them in the first place.

Constraints

Many model owners and users do not realize the simplifications most practical activity-based make that result in inconsistencies in time, space, and vehicle allocation.

Key Hypothesis #2

Many model owners and users do not realize the simplifications most practical activity-based make that result in inconsistencies in time, space, and vehicle allocation.

Particularly problematic for reasonable forecasting when assuming broad adoption of personally-owned AVs.

Key Hypothesis #2

Proposal

Step 1
Let’s develop some standard metrics and assess the performance of existing, practical activity-based models.

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#	Metric	Illustrative Example
1	What share of person-level itineraries can be accomplished when simulated travel times are considered?	65 percent
2	For what share of parent-child chauffeur movements is the parent taking the child to the same place and at the same time, as detailed in the parent's itinerary, as the child is going, as detailed in the child's itinerary?	N/A (i.e., chauffeur movements are not described in sufficient detail to know)
3	For single automobile households, in what share of households is the family's single vehicle in a different place at the same time?	25 percent
4	For multiple automobile households, in what share of households are individual vehicles in a different place at the same time?	N/A (i.e., individual vehicle movements are not described in sufficient detail to know)

Proposal

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Proposal

Academic Interest?

The practical community is rapidly adopting simple ABM formulations. Adapting these formulations for consistency is a formidable challenge.

Questions?