

Discovering Customer Journey Maps using a Mixture of Markov Models

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Customer journey

Customer journey map

XES - Standard

Challenge

E-M Markov models

Case study

Feature 1

Feature 2

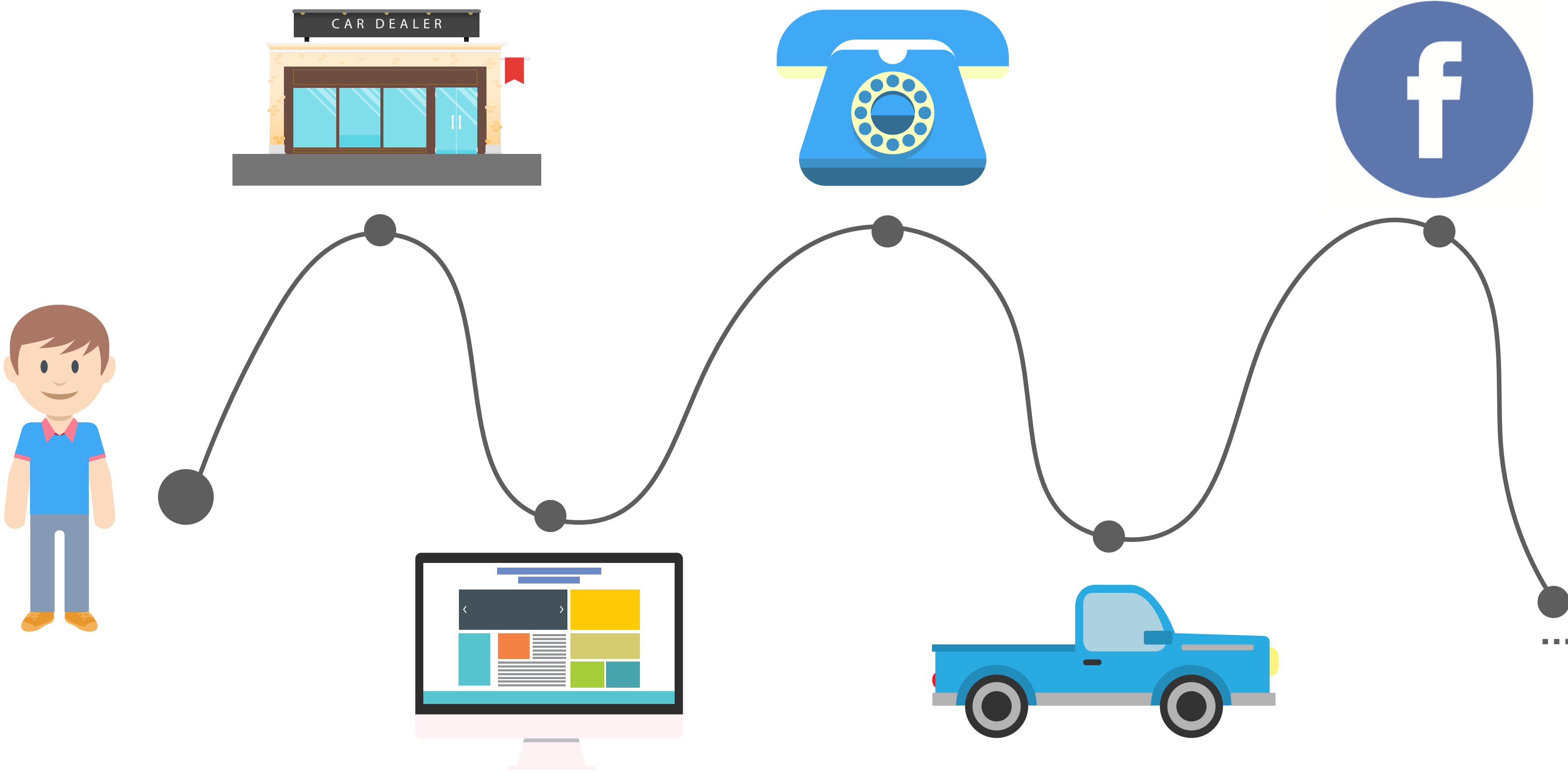
Feature 3

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Customer Journeys.

Path followed by a customer to consume a service.



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Customer Journeys: Capture the Customer Experience.

Customer journeys are becoming increasingly complex

- Numerous channels / devices
- Increasing number of interactions

« Improving understanding of customers has been ranked one of the most important research challenges in the coming year [1] »

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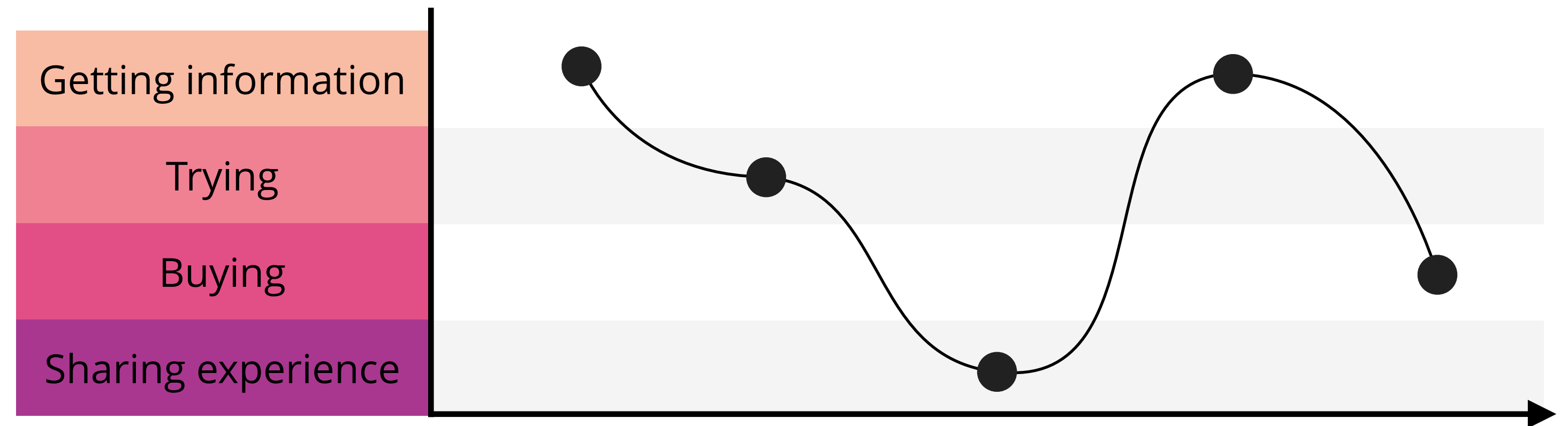
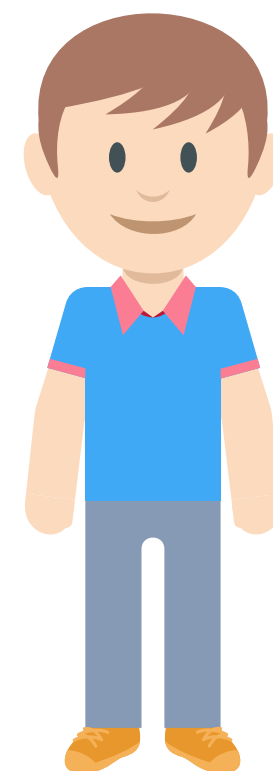
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CJMs: A customer-centric approach.

Customer Journey Maps (CJMs) are used to understand, discuss, or improve the main paths in the usage of a service

Mostly used as a design thinking tool / strategic tool



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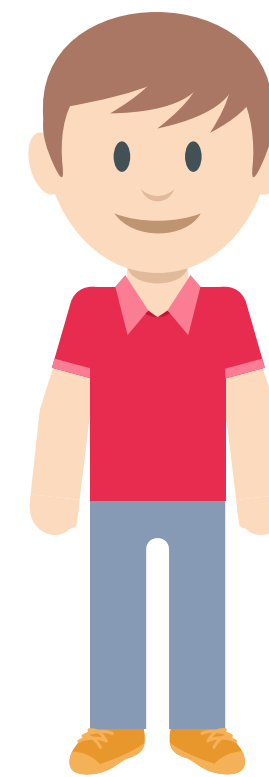
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Strategy vs. Reality.

« People don't behave like robots, and no matter how well we craft an experience, they will not perceive exactly as we anticipate or hope » [2]



[2] Richardson, A.: Series on customer journey: Using customer journey maps to improve customer experience, using customer journey maps to improve customer experience, touchpoint bring the customer experience to life. Harb Bus Rev (2010)

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XES: Discovering CJMs from Event Logs.

- When customers interact with a service, it (often) leaves traces
- We can leverage these traces to provide fact-based insights on customer journeys
- Inspired from Process Mining
- INPUT: The XES standard is adequate to store CJMs [3]

Journey	Activity	Timestamp	Customer
1	Getting information	10.05.2016	Z.Davis
	Trying	10.05.2016	Z.Davis
	Buying	10.05.2016	Z.Davis
	Sharing experience	10.05.2016	Z.Davis
2	Getting information	11.05.2016	O.Palmer
	Trying	11.05.2016	O.Palmer
	Buying	11.05.2016	O.Palmer
	Comlaining	12.05.2016	O.Palmer

[3] Bernard, G., & Andritsos, P. (2017). A Process Mining Based Model for Customer Journey Mapping.

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Challenge: Summarize the Logs using K Representative Journeys.

① Event logs
(e.g., XES)

1	B	D	A		
2	E	C	G	A	
3	B	D	A	F	
4	B	D	F		
5	E	C	G	C	A

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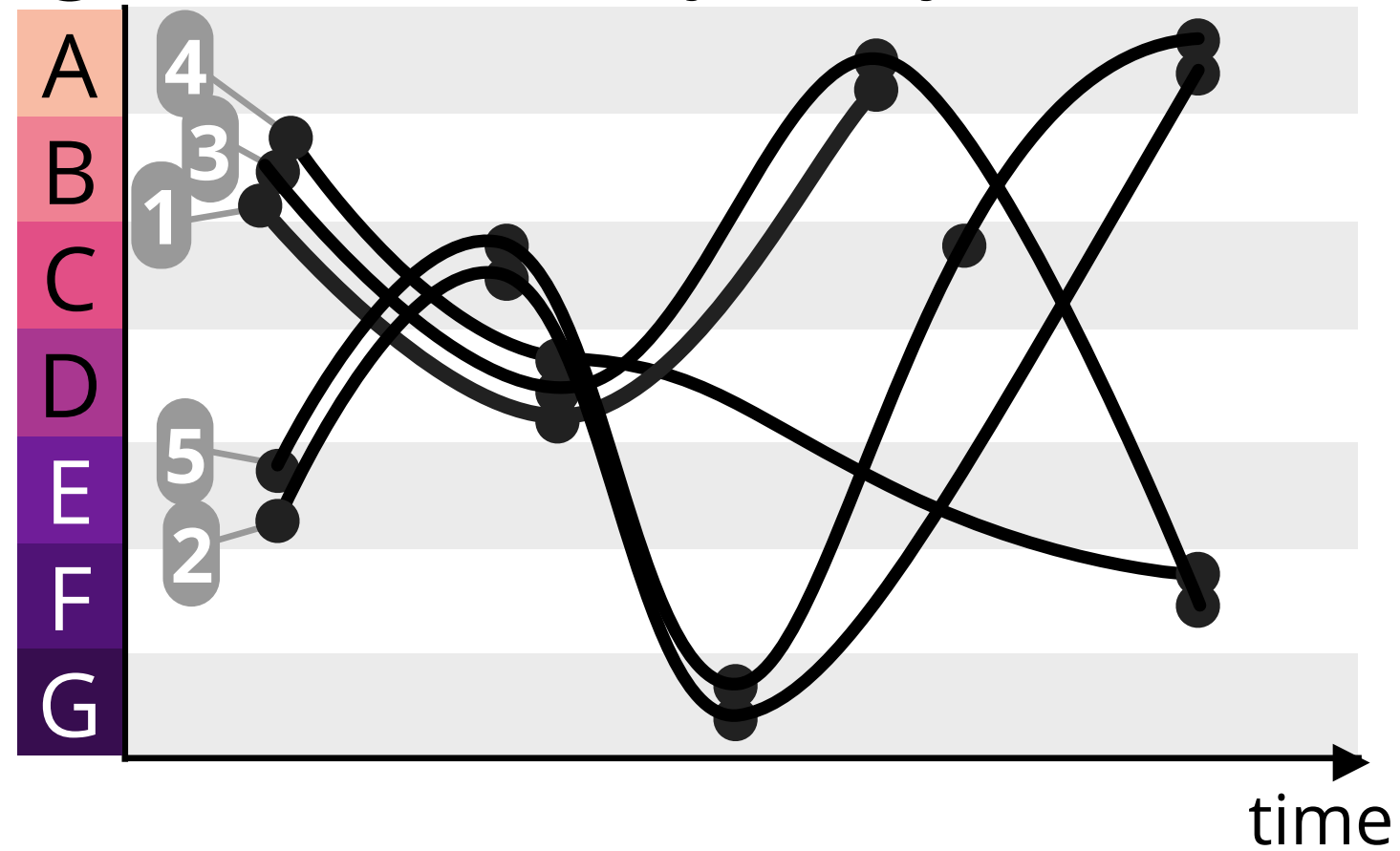
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② CJM with actual journeys



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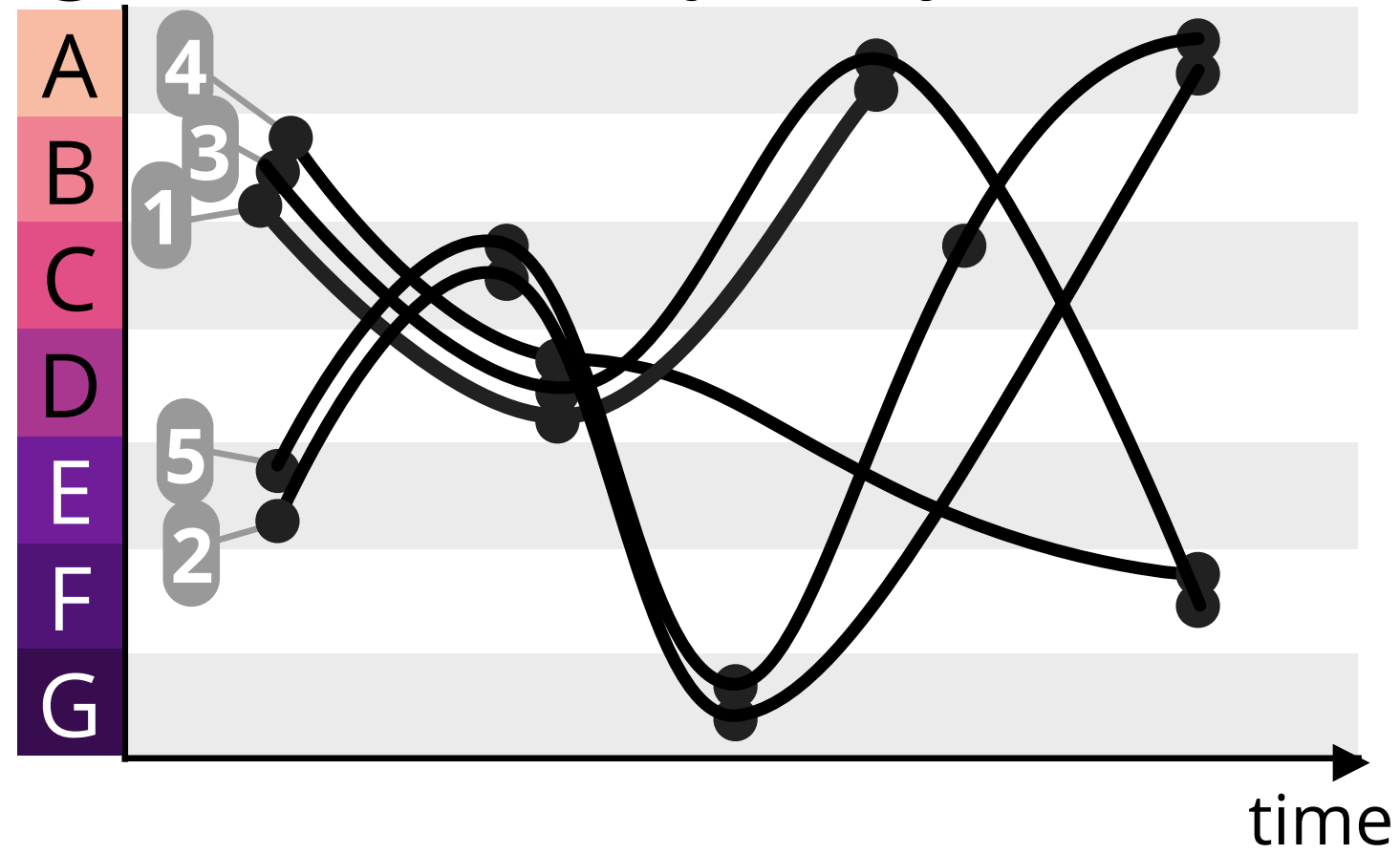
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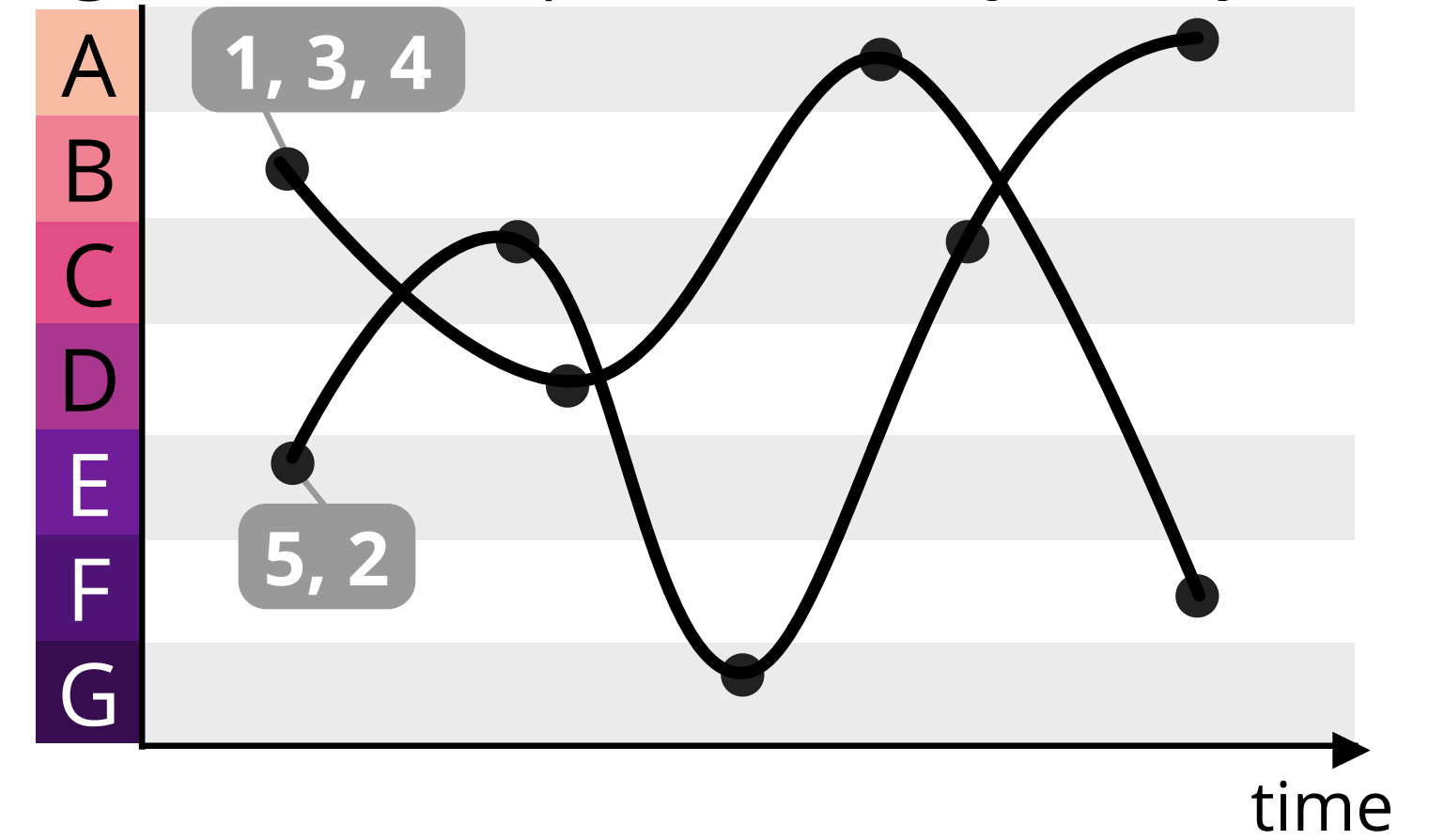
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② CJM with actual journeys



③ CJM with representative journeys



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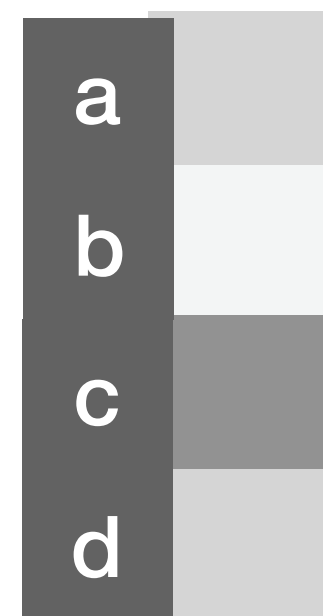
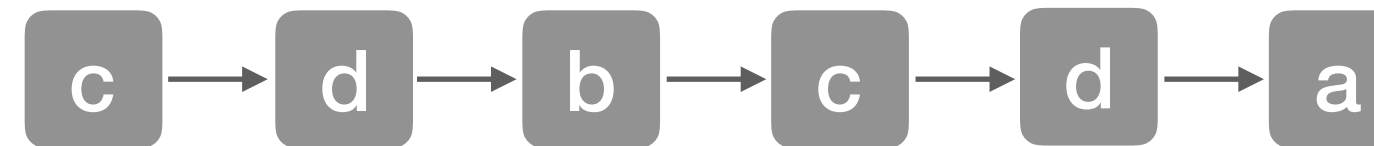
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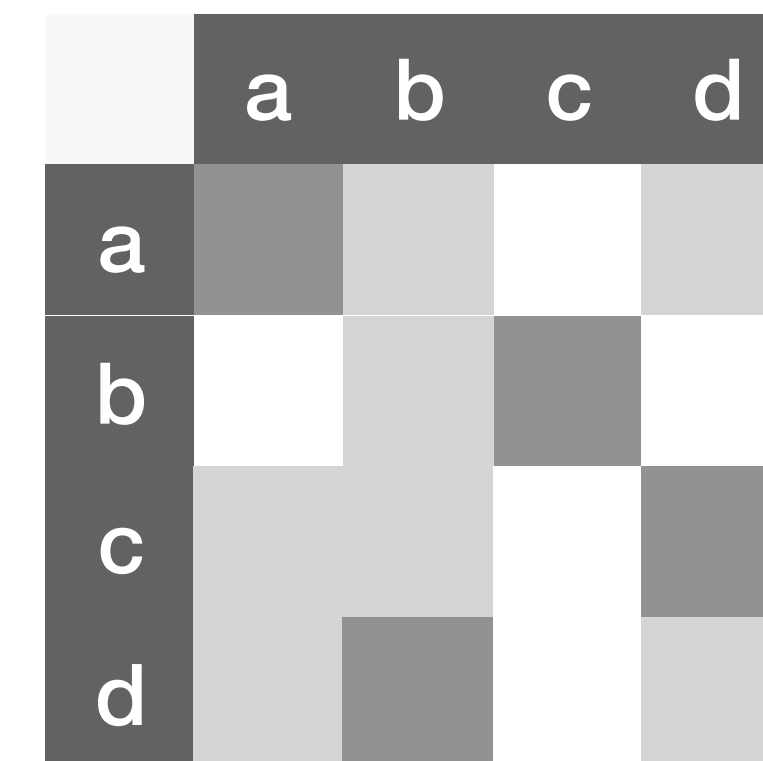
Markov models: Modelling sequences.

« In probability theory, a **Markov model** is a stochastic model used to model randomly changing systems. It is assumed that future states depend only on the current state, not on the events that occurred before it. » - Paul A. Gagniuc

Markov model



First probability vector



Transition matrix

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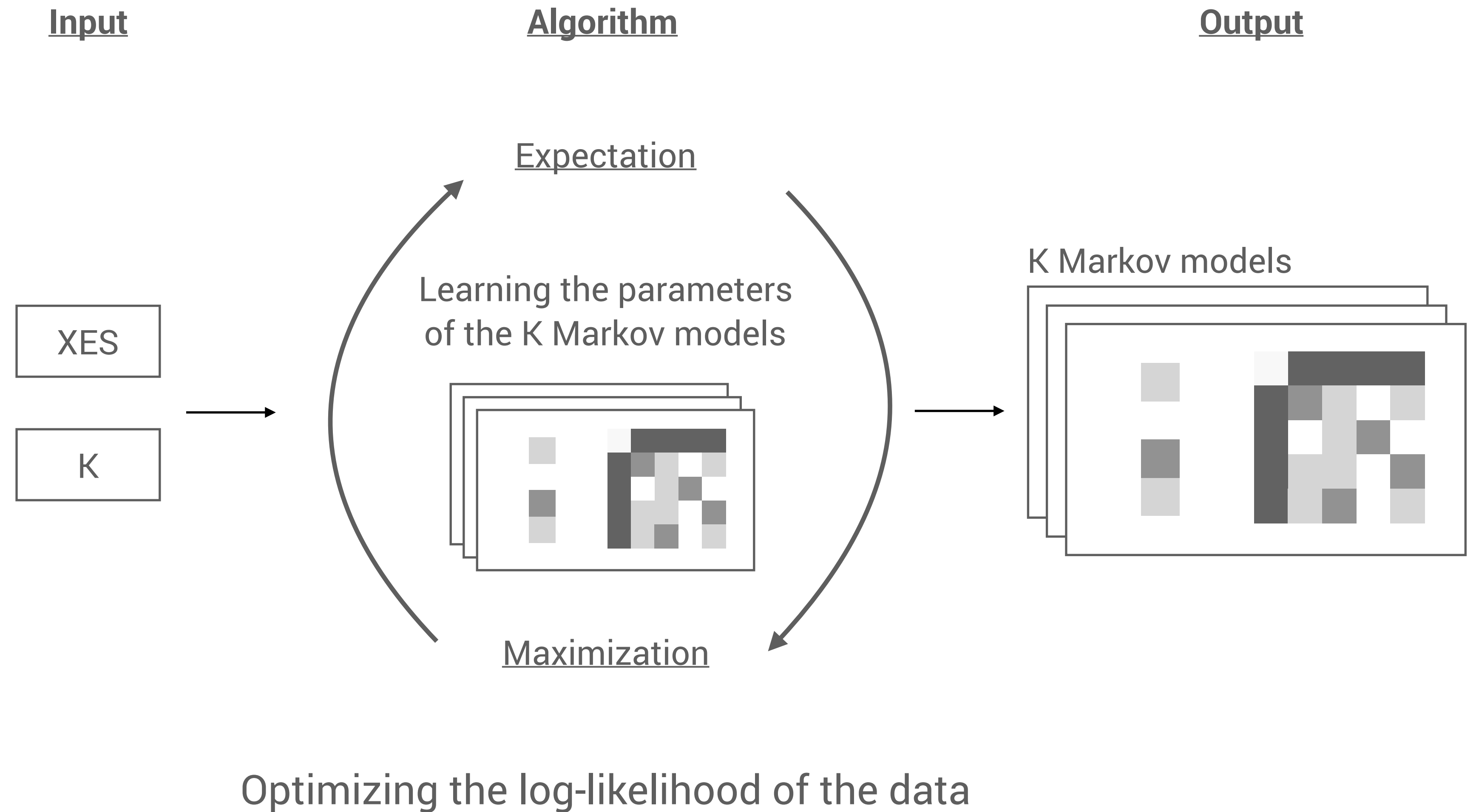
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Expectation-Maximization on a Mixture of Markov Models.



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Case study: The Dataset.

*An **activity-based travel survey** conducted in the Chicago metropolitan area over a demographic representative sample of its population.*

29,542 journeys - **2,381** are unique

“being at home” → “going to school” → “having a meal” → “being at home”

16 types of events

Average number of events per journey: **4.8**

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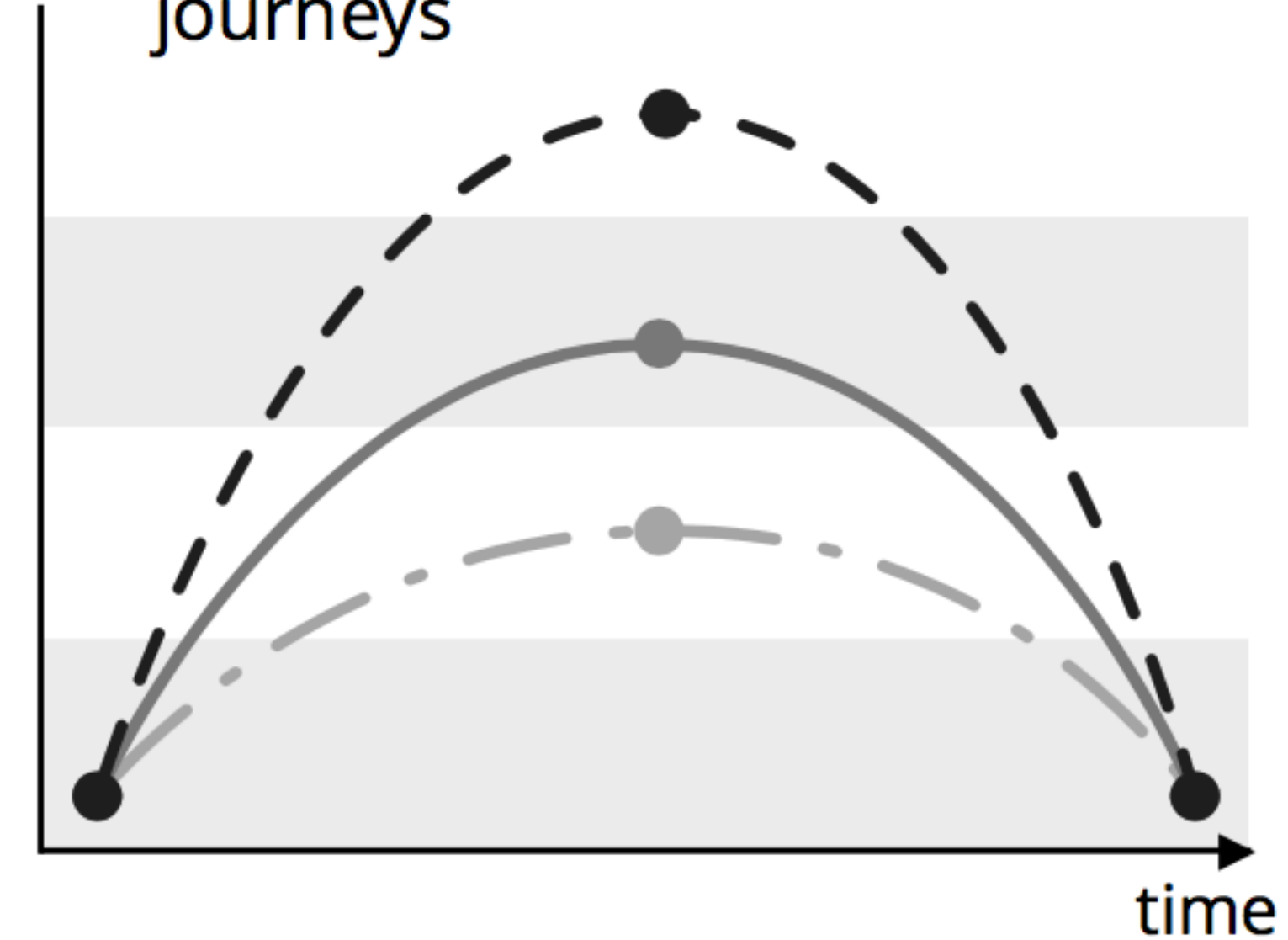
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Case Study: Results.

Activities:



① Most likely representative journeys



LEGEND



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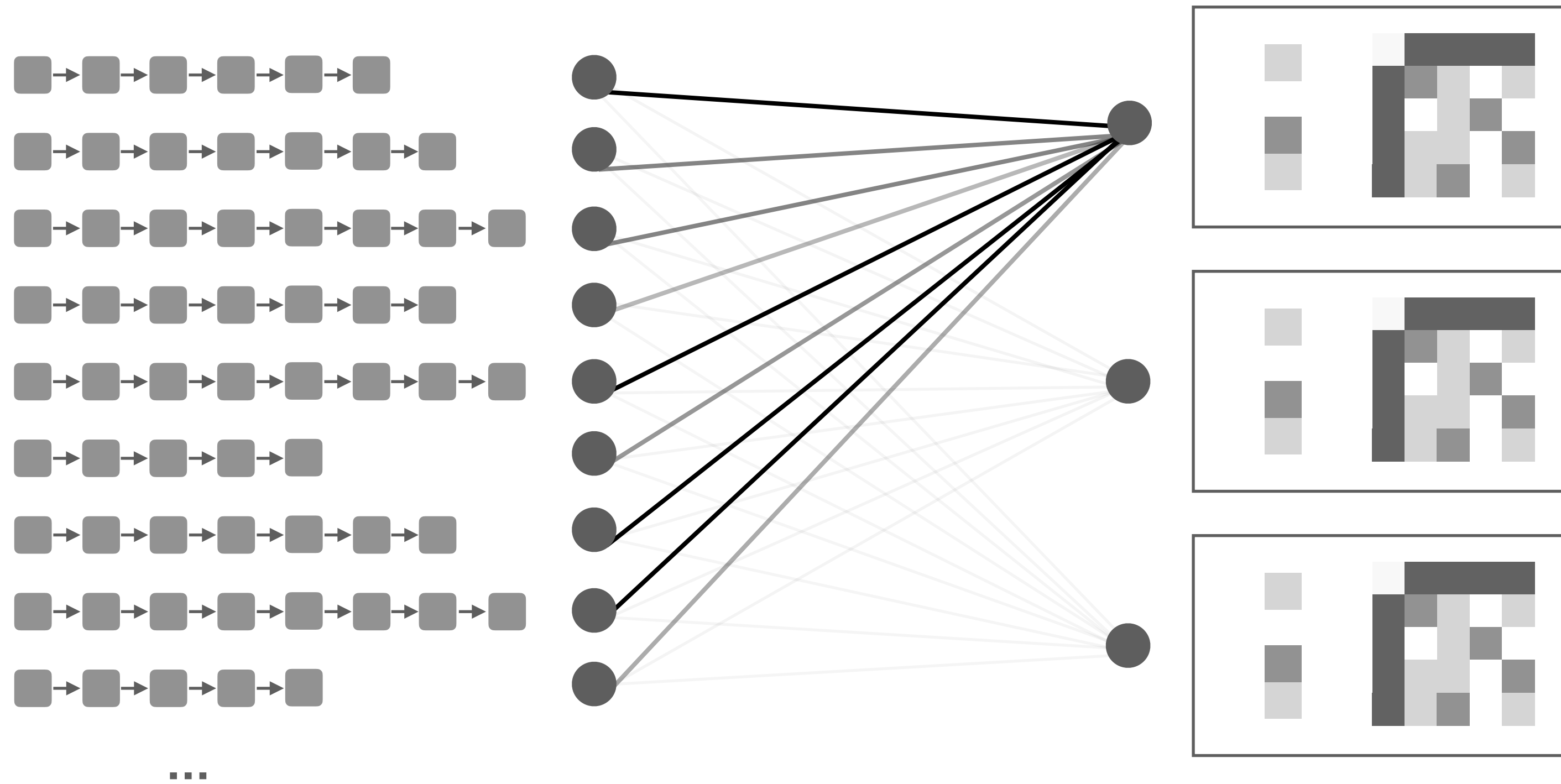
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Feature 1: Each Model is Responsible for each Journey.



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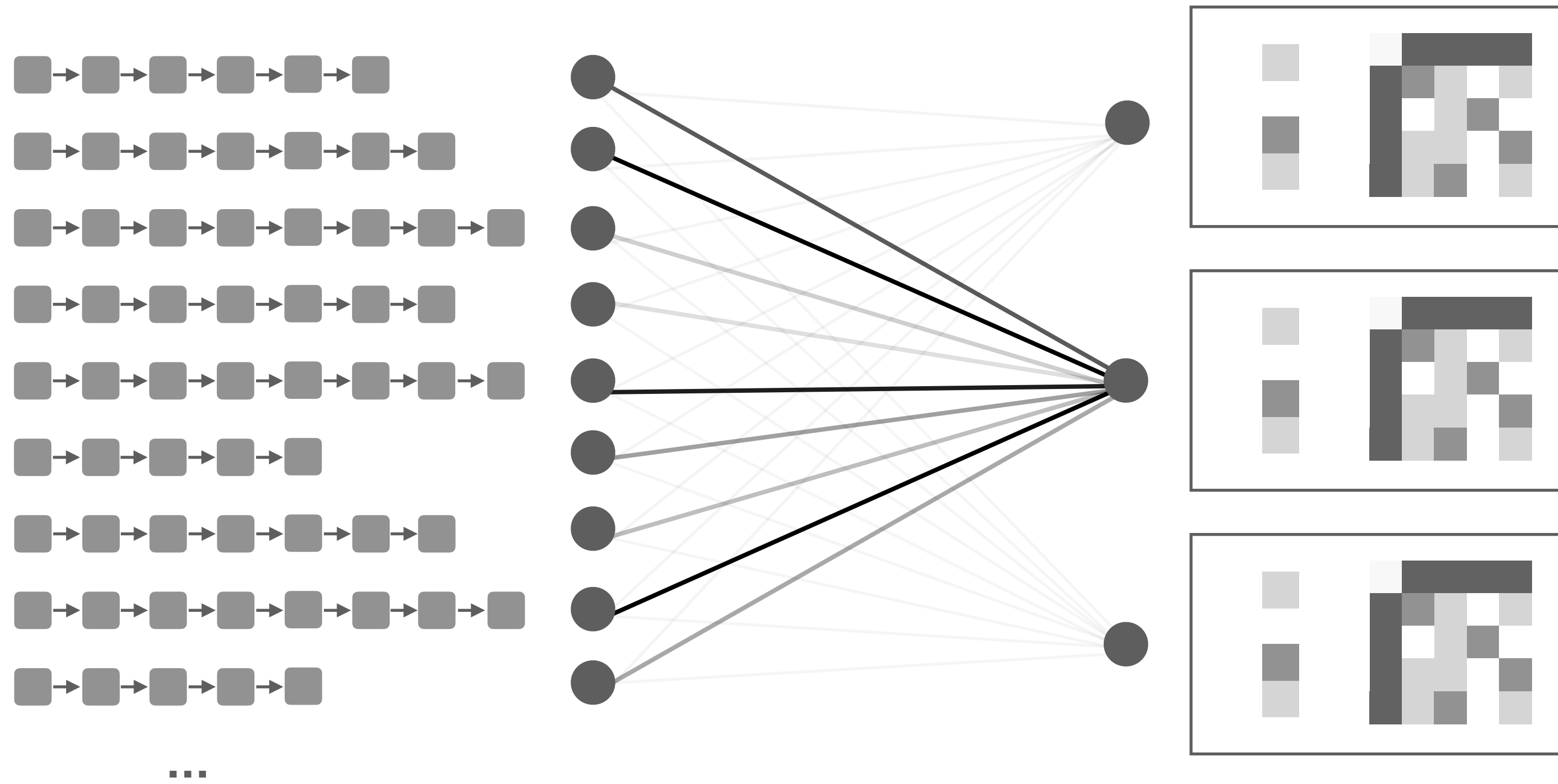
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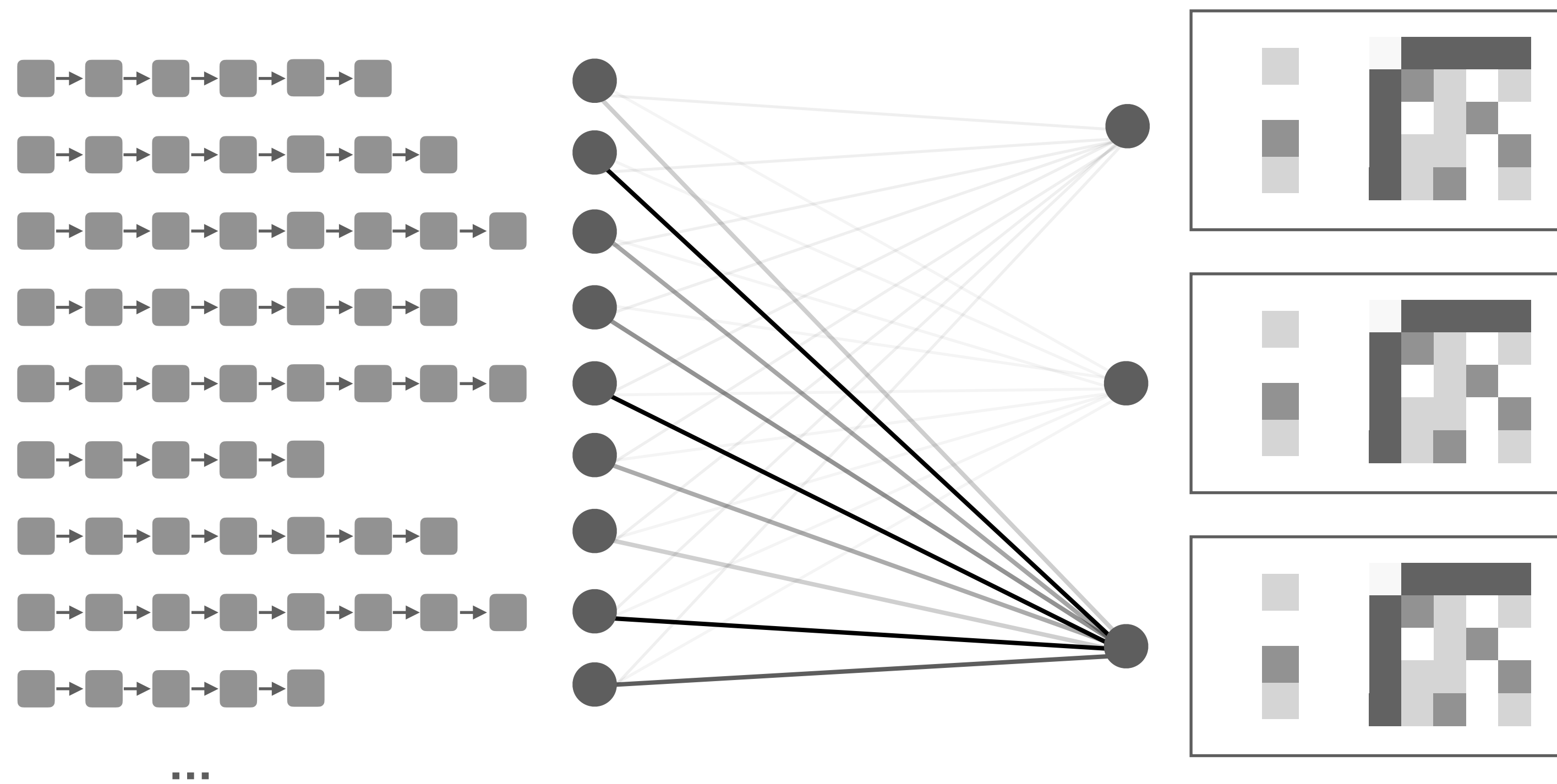
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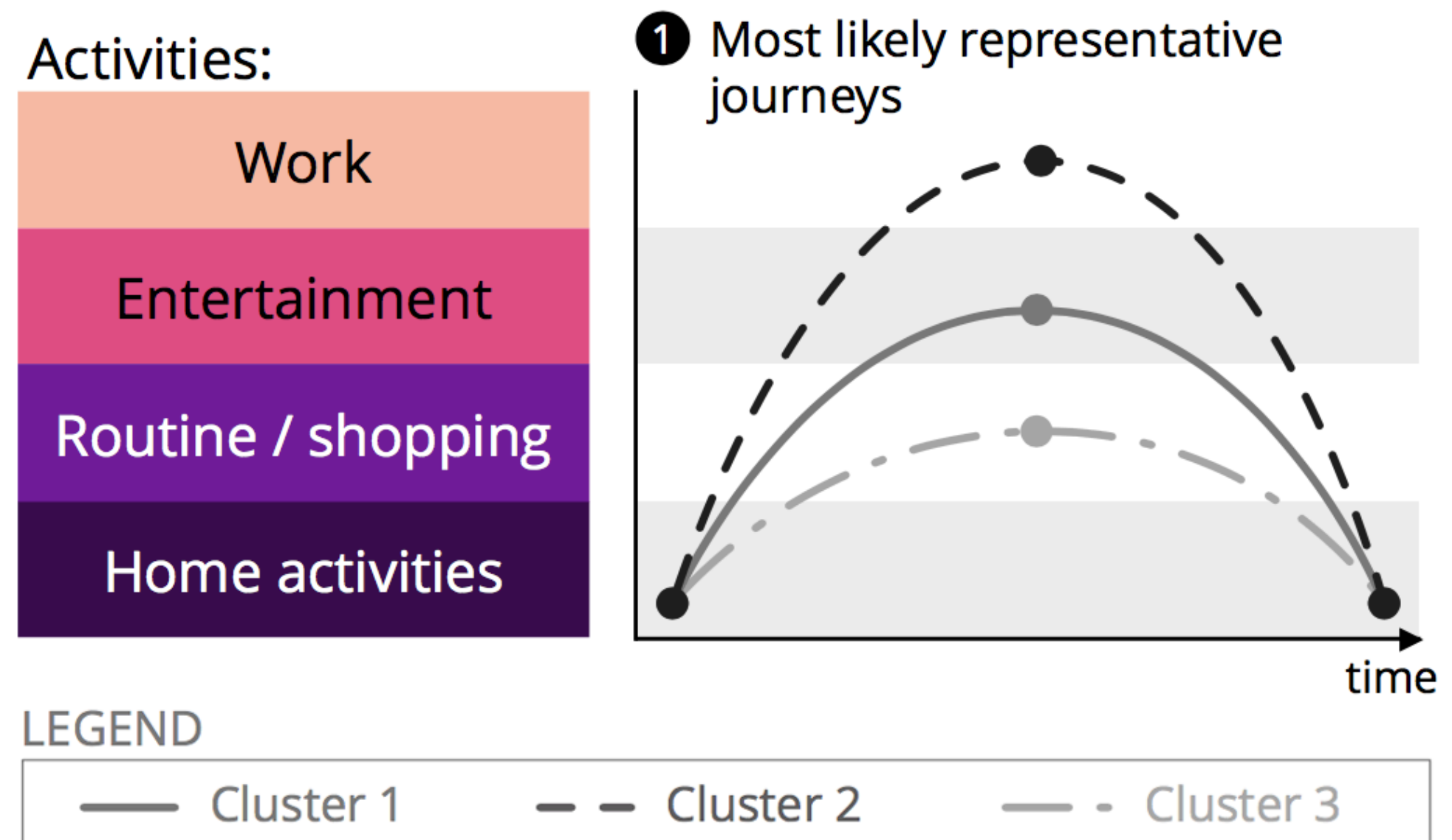
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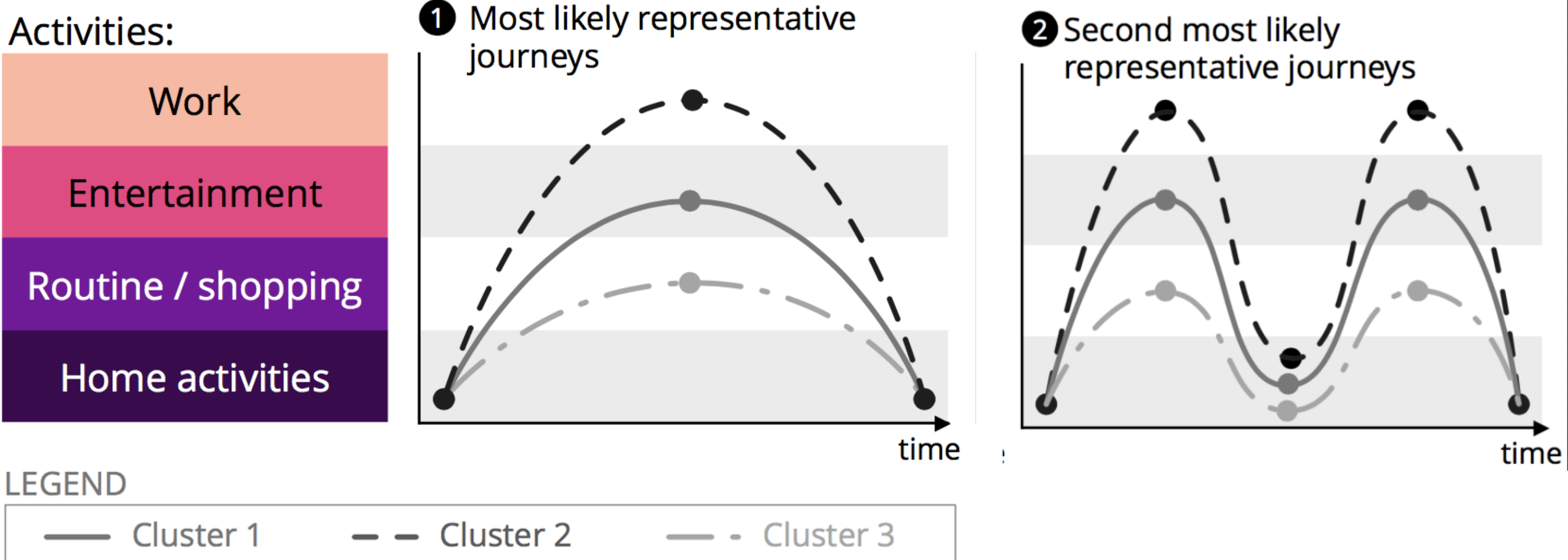
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Feature 2: Limited Number of Parameters.

As input:

Feature ~~X~~ engineering

Distance ~~X~~ metric

K - Which can potentially be computed upfront thanks to information criterion technics

Parameters set by a human can have an **important impact** on the representative journeys. The E-M on a mixture of Markov models allows to discover the representative journeys much more **naturally**.

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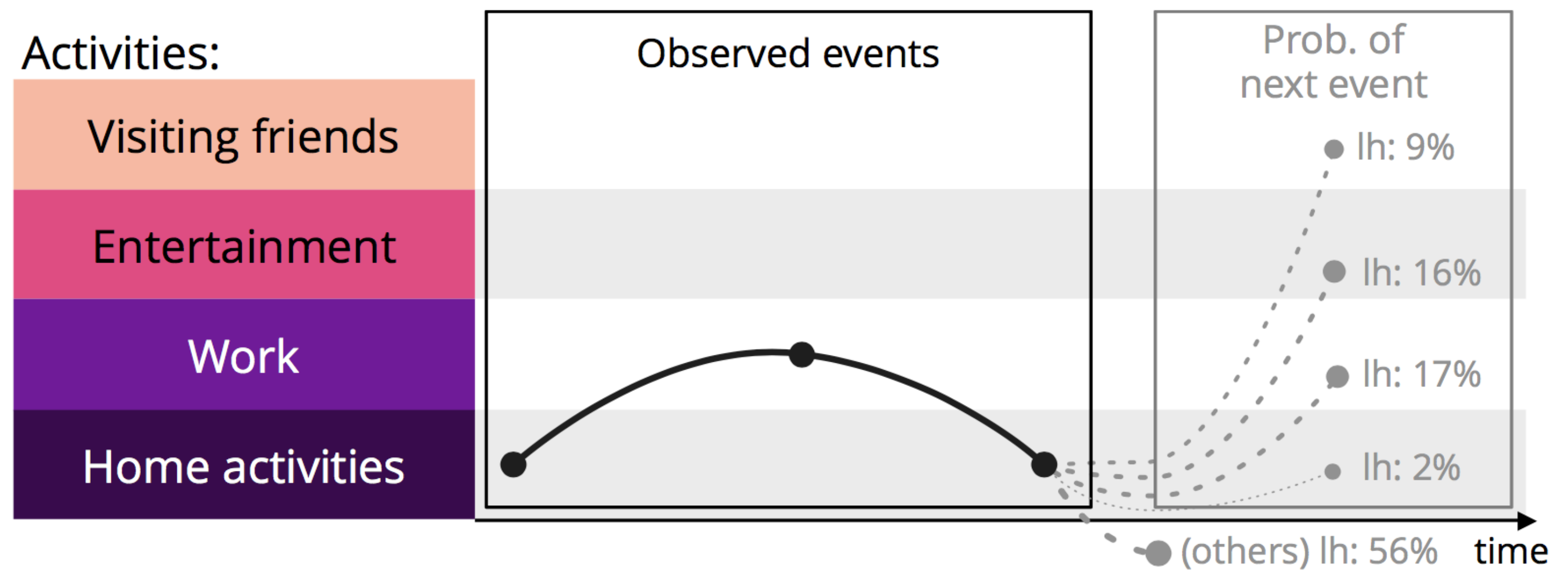
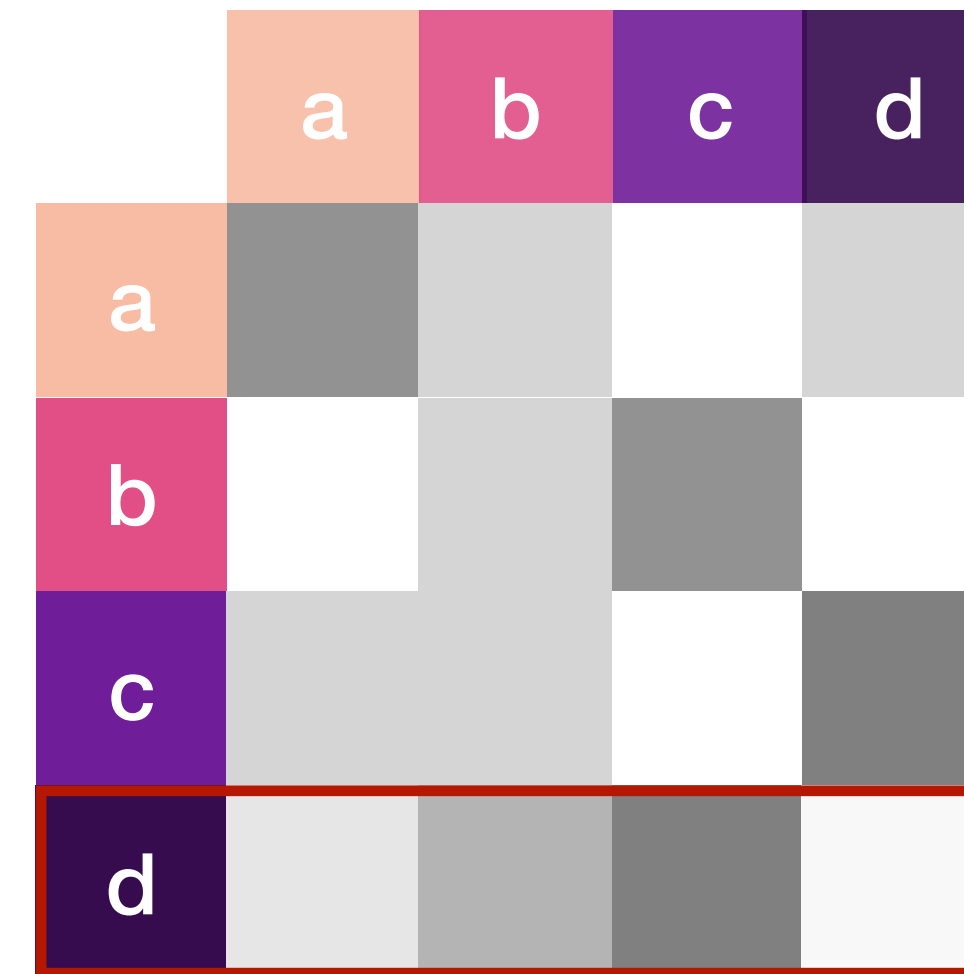
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Feature 3: Computing the Next Most Probable Event.



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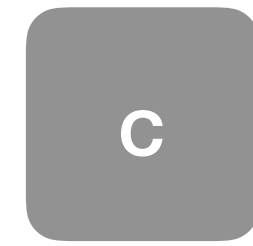
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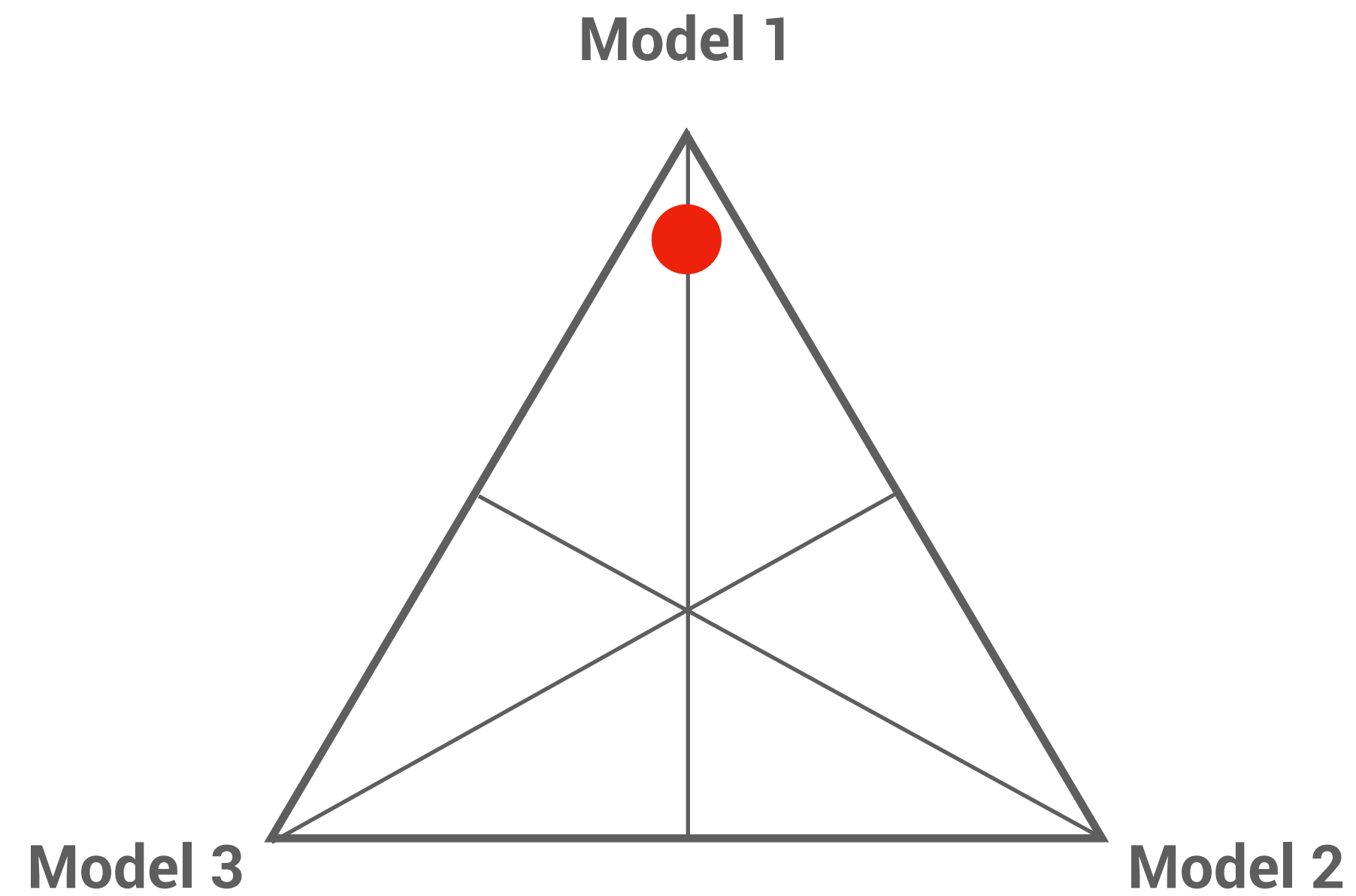
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Feature 4: Handling Shifting Behaviors - Soft Clustering.



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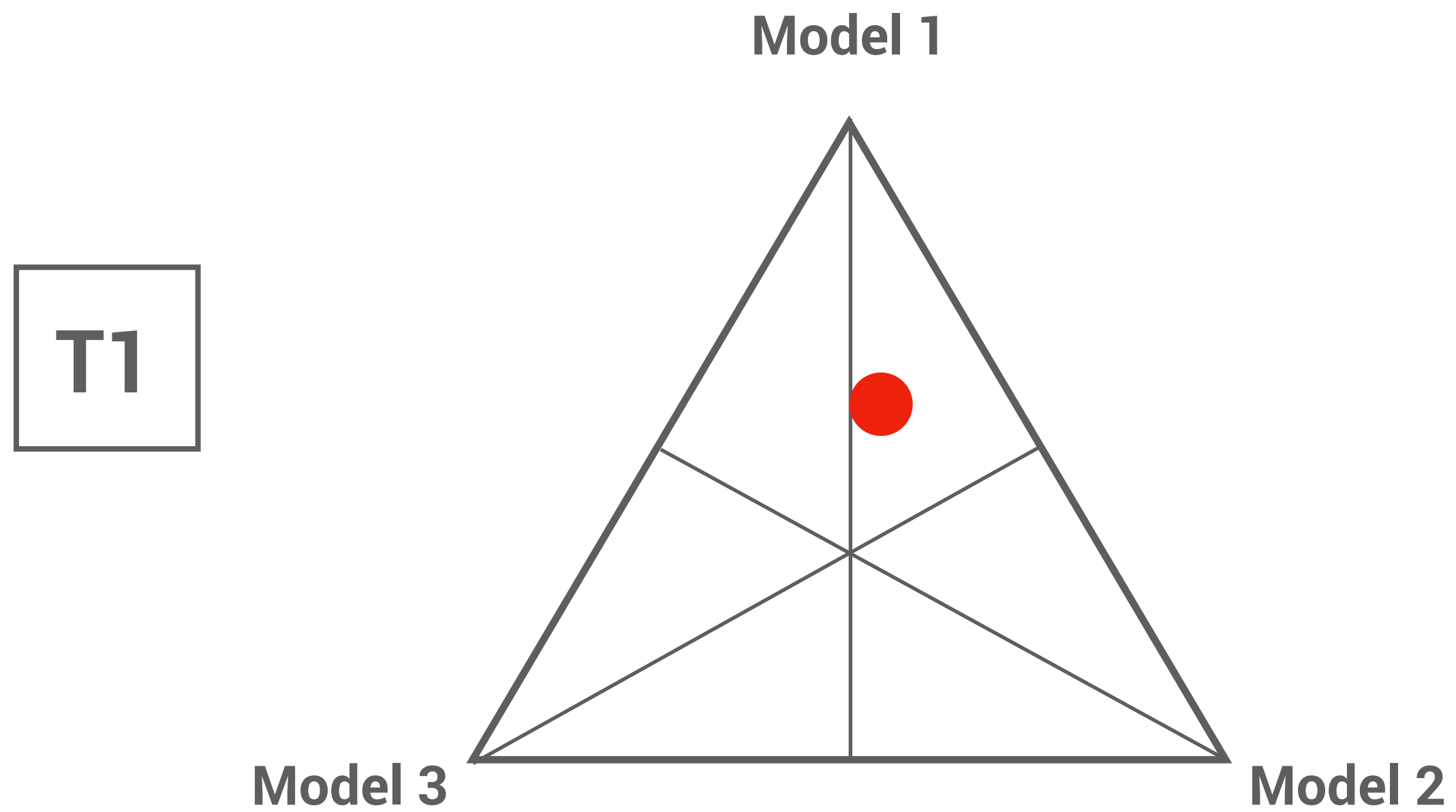
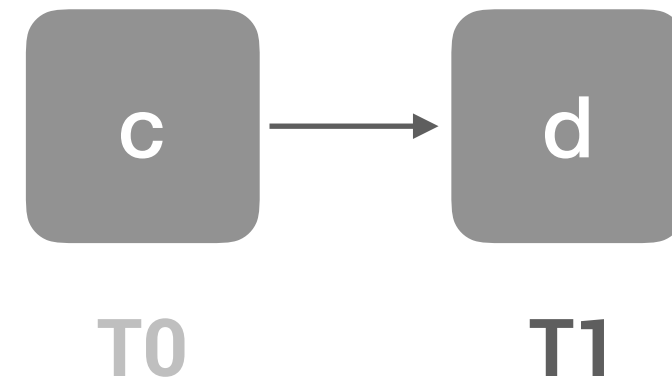
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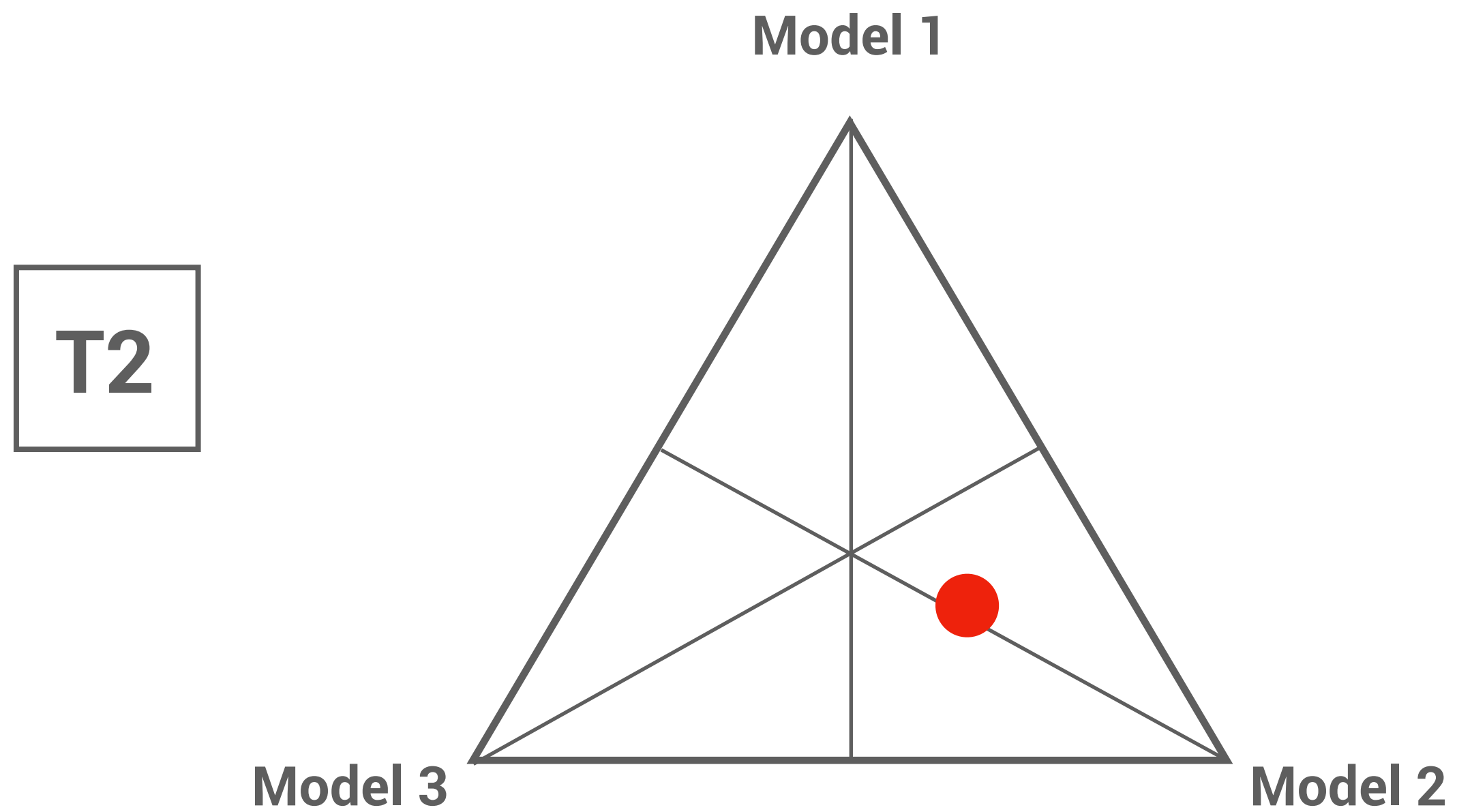
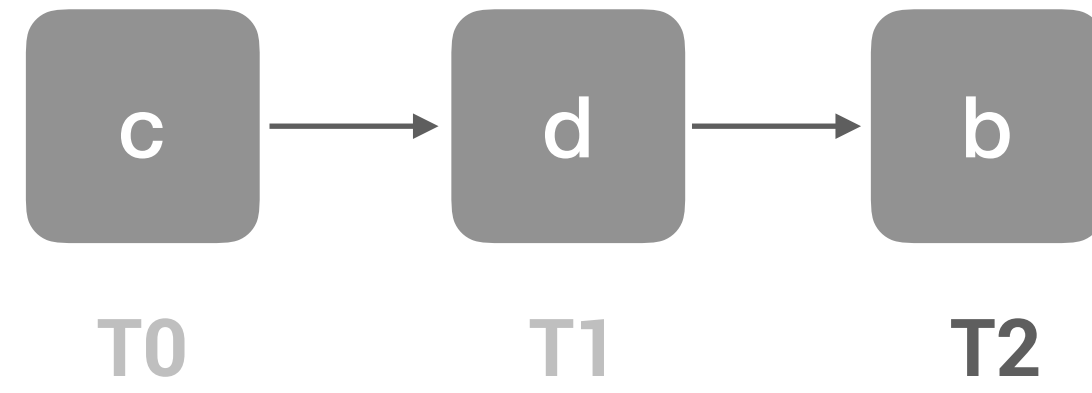
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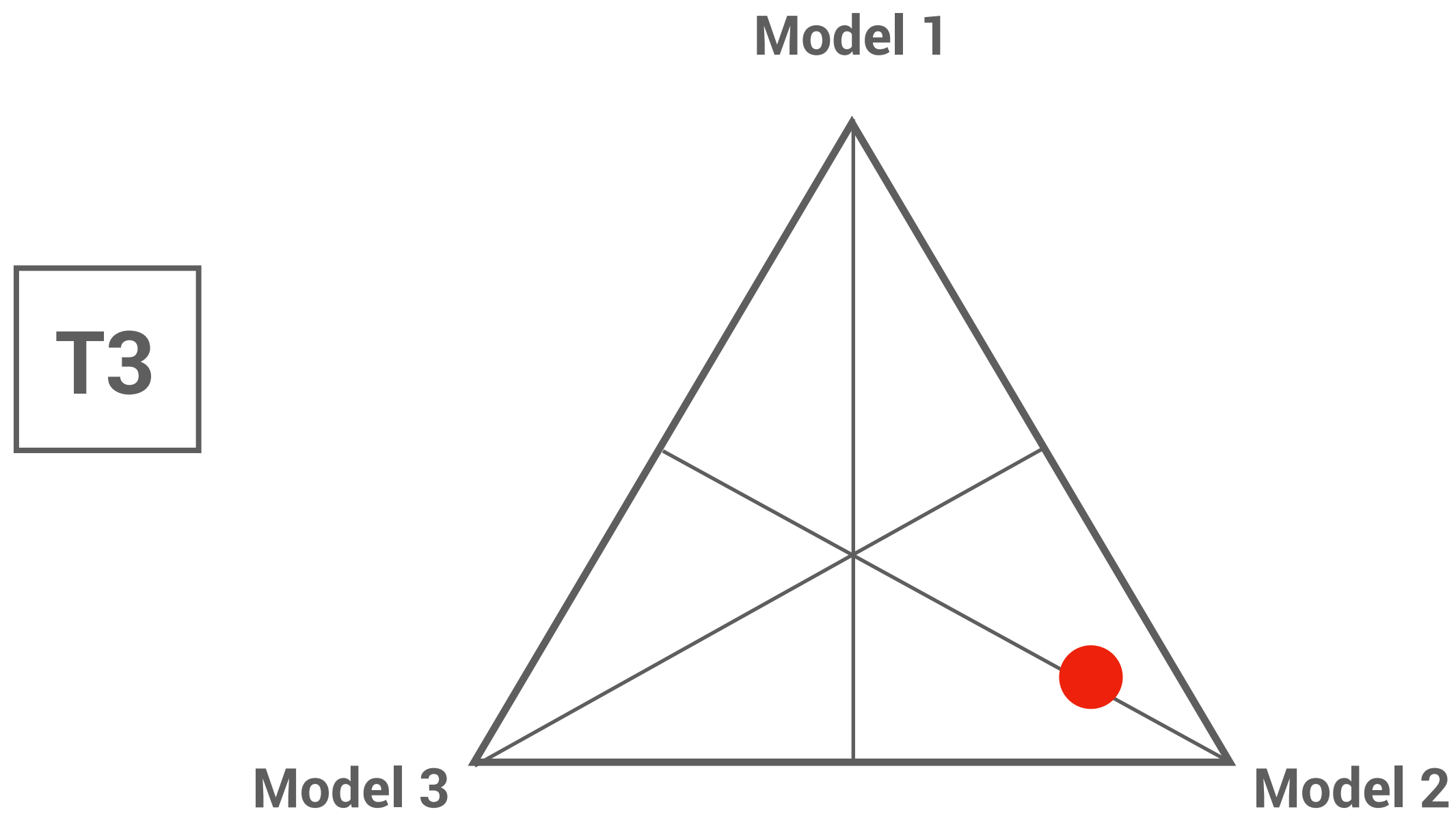
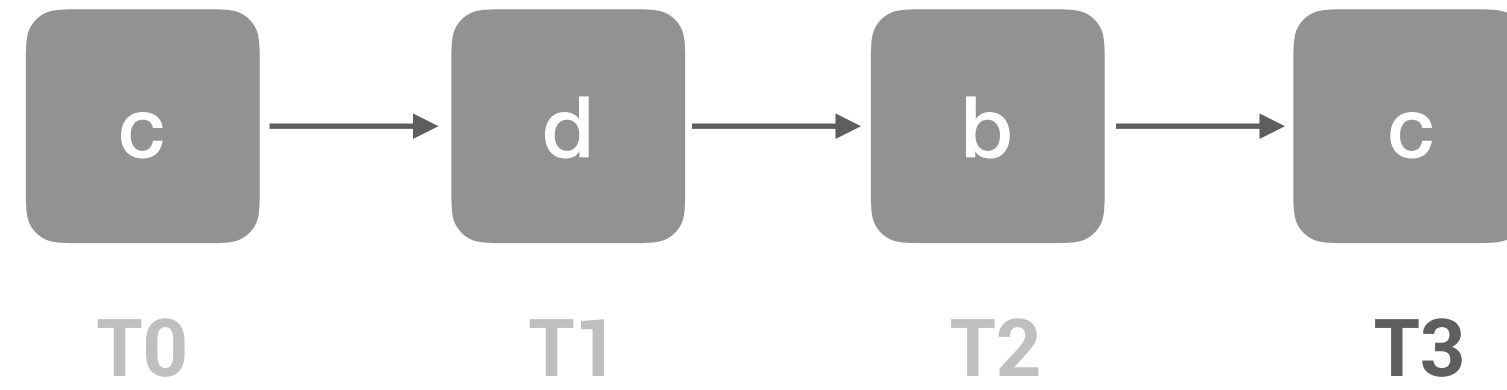
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Kudelski application

Probabilistic approach robustness

Research in progress!

Q&A