

# Predicting Opponent Strategy in StarCraft: A Bayesian Programming Approach

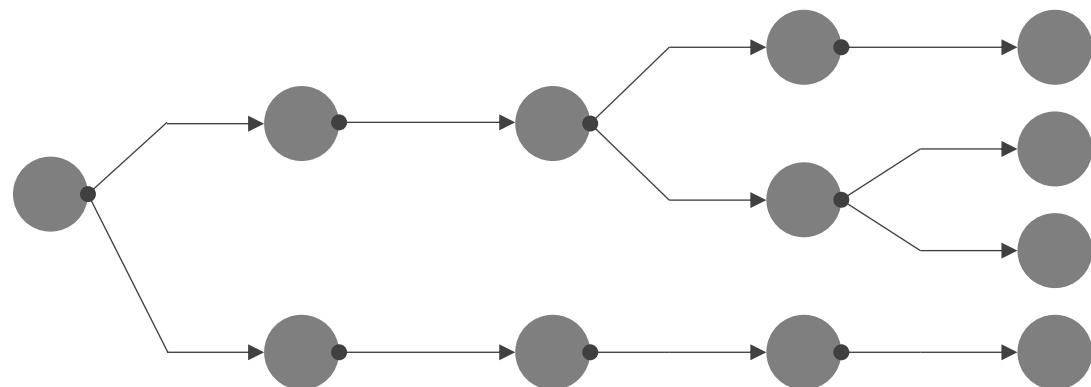
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September 19, 2019  
Alex Parker



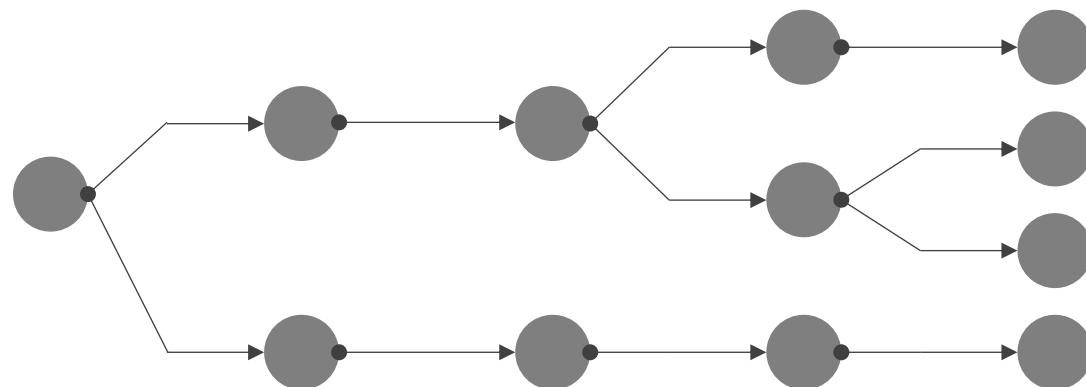
# Exponential Complexity

- Applications:
  - Customer segmentation
  - Financial options pricing
  - Hierarchical data storage / access



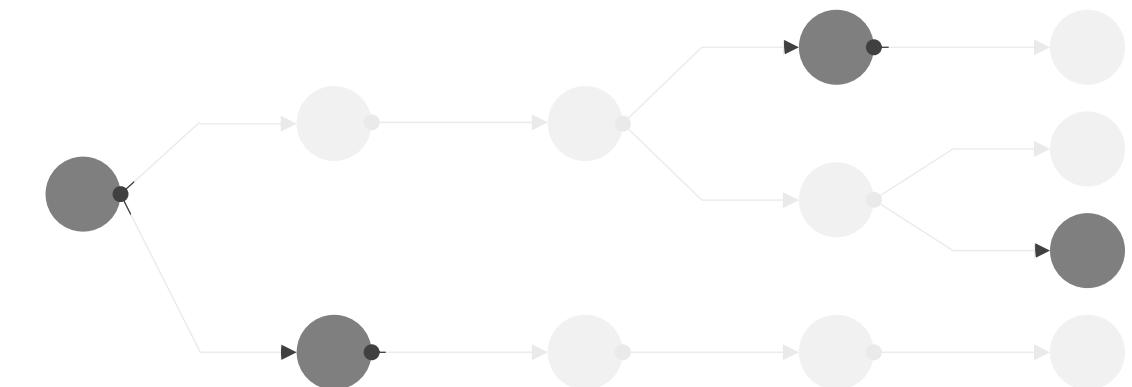
## Exponential Complexity

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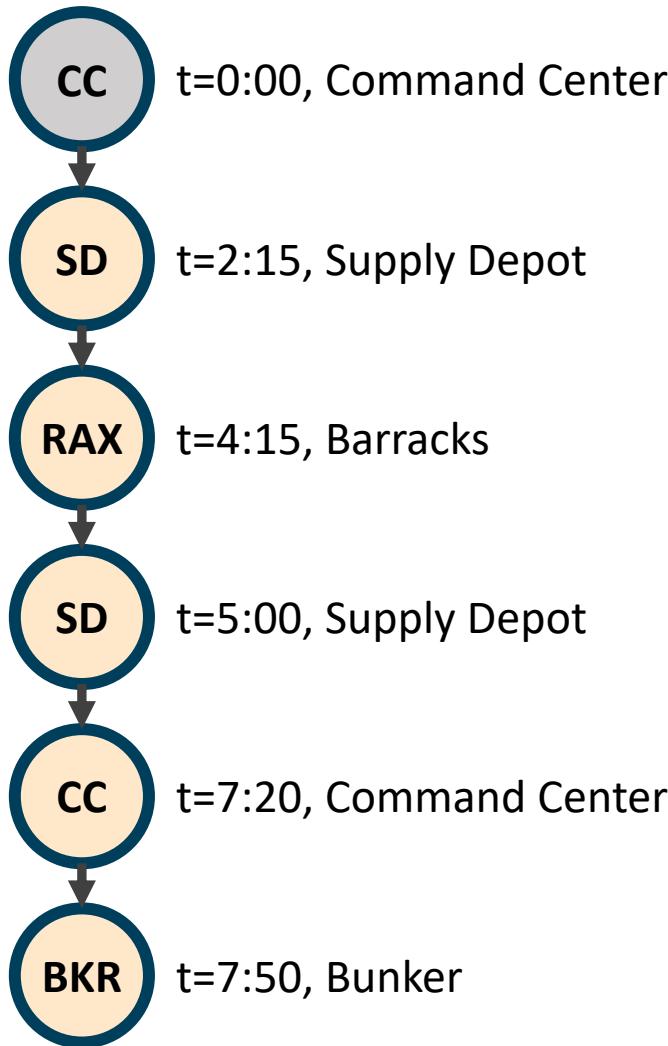


## Imperfect Information

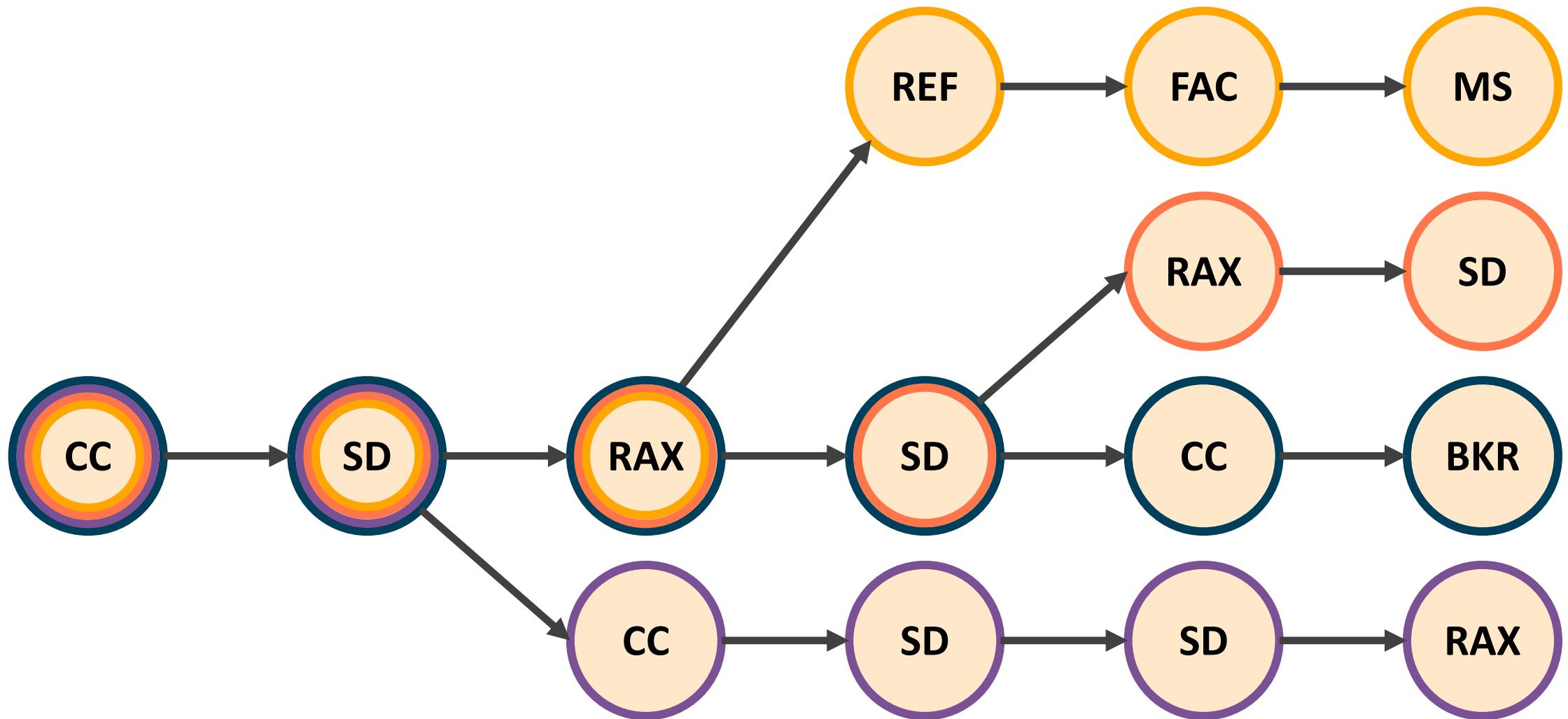
- Applications:
  - Understanding new customers
  - Signals in financial forecasting
  - Probabilistic simulations



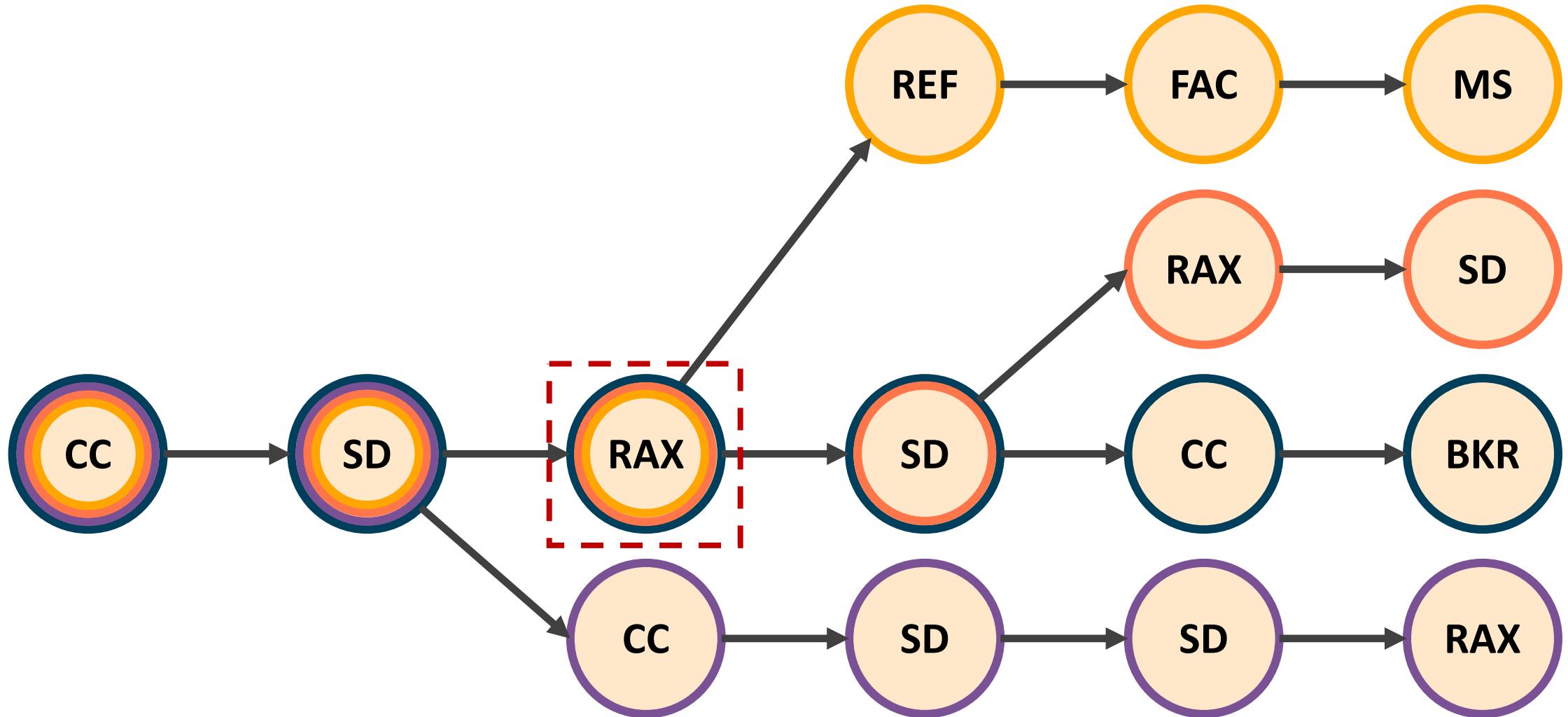
# StarCraft Modeling: Exponential Complexity



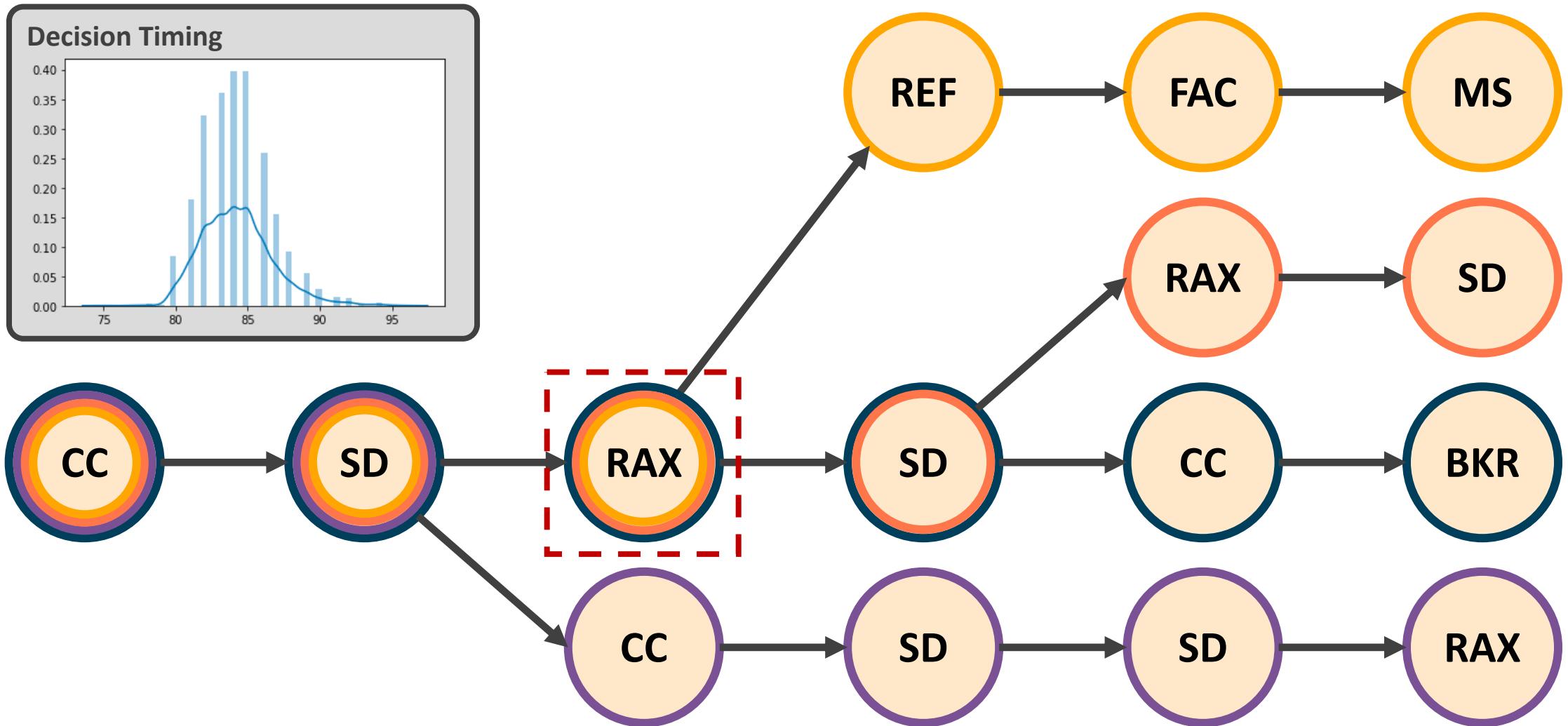
# StarCraft Modeling: Exponential Complexity



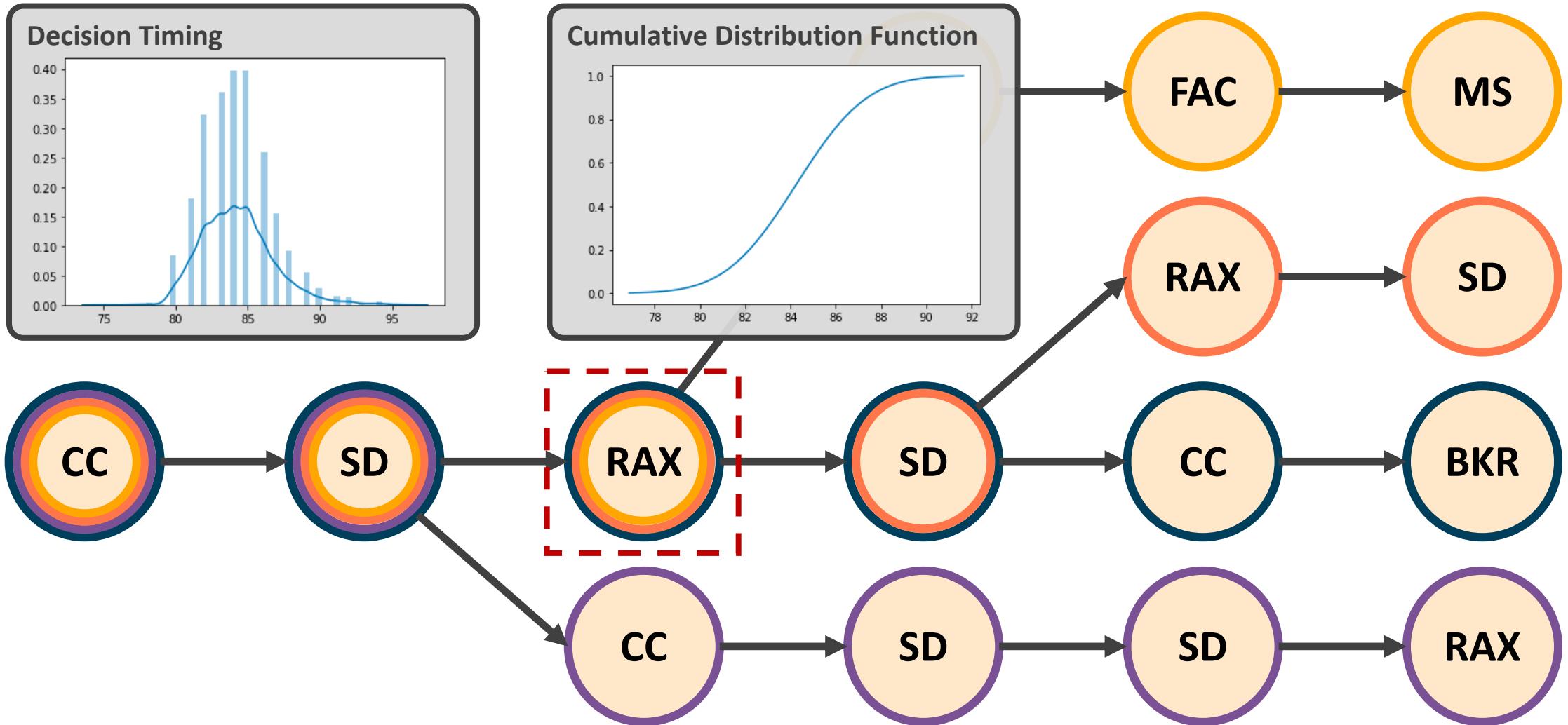
# StarCraft Modeling: Imperfect Information



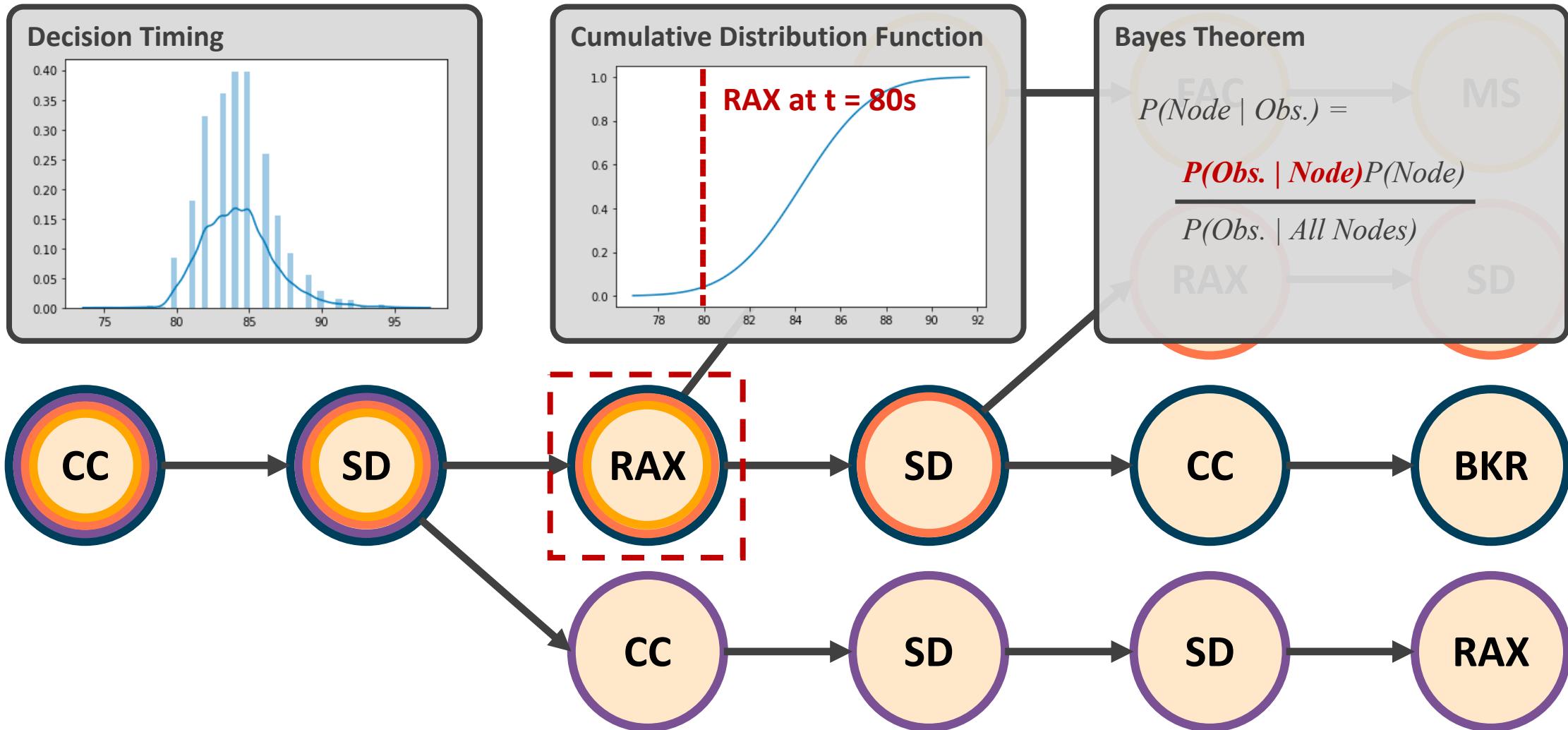
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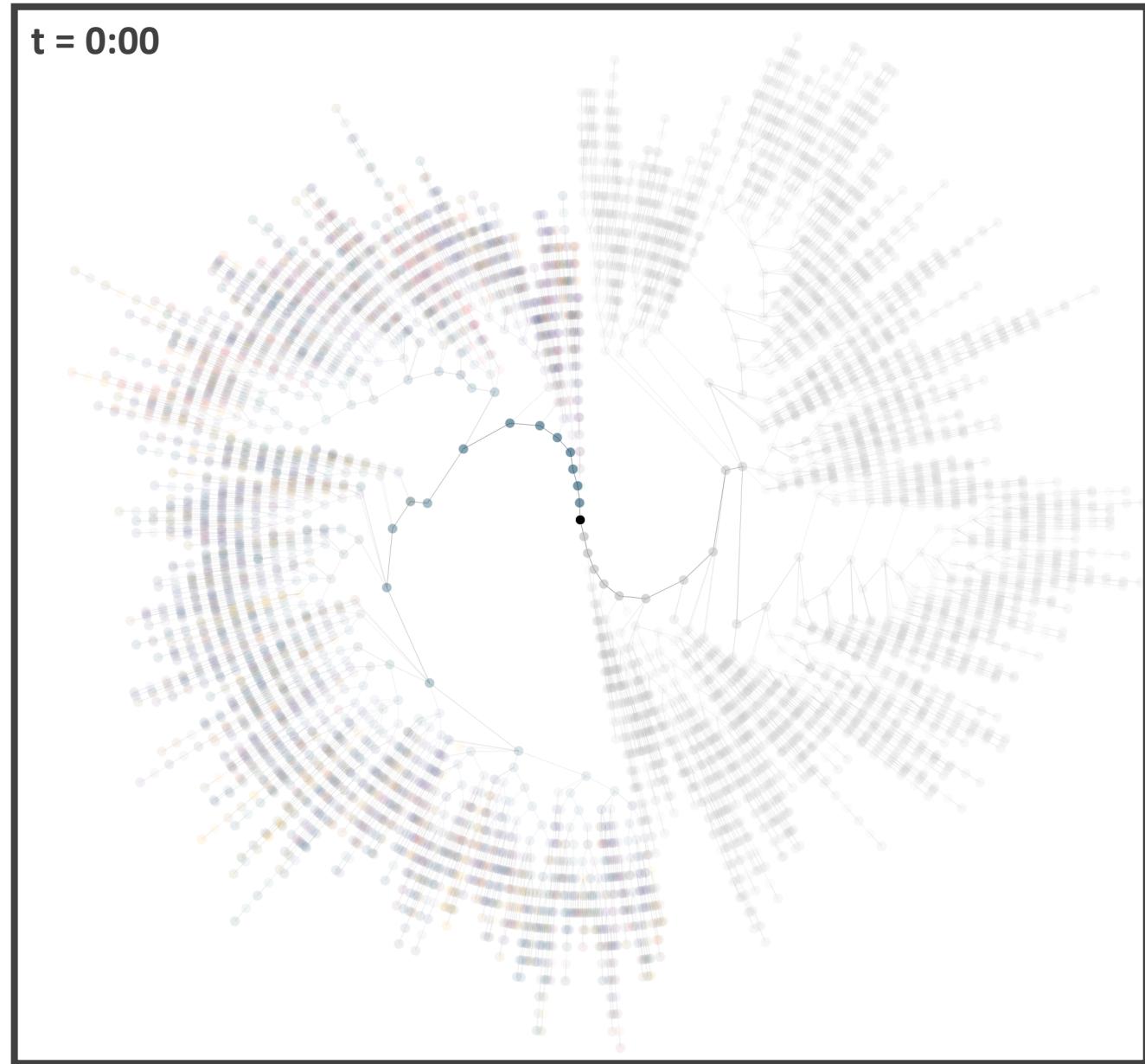


# StarCraft Modeling: Imperfect Information



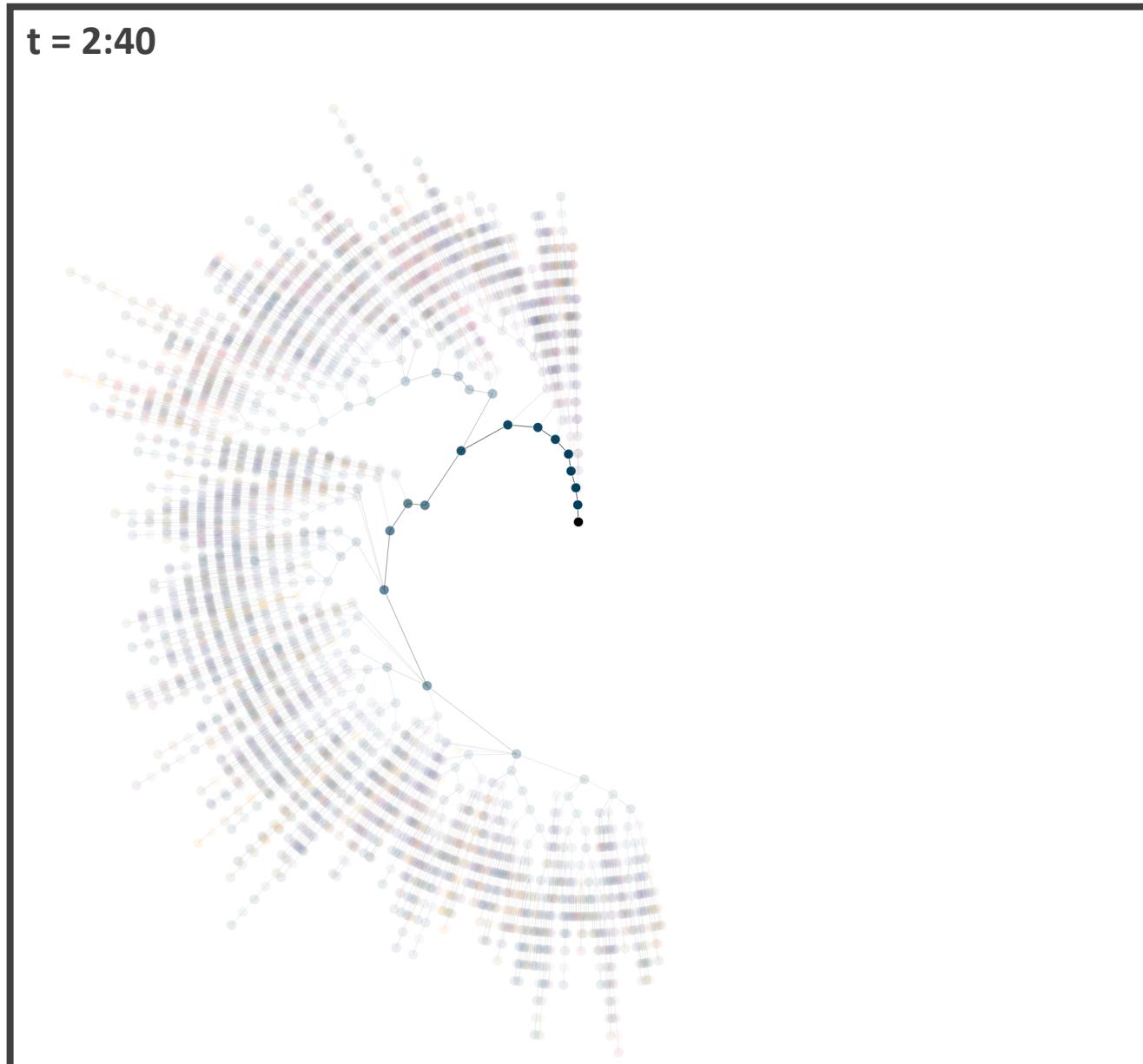
Time	Observation
0:00	No Observation
2:40	1x SCV
5:27	2x Factories
8:05	3x Goliaths
8:41	1x Starport
8:44	2x Vultures

Strategy	Probability
Bio Terran	15%
Econ Mech	7%
Aggressive Mech	15%
Air Aggression	1%
Mixed Air Control	3%
Tank Air Control	3%
Mobile Mech	7%
Protoss	50%



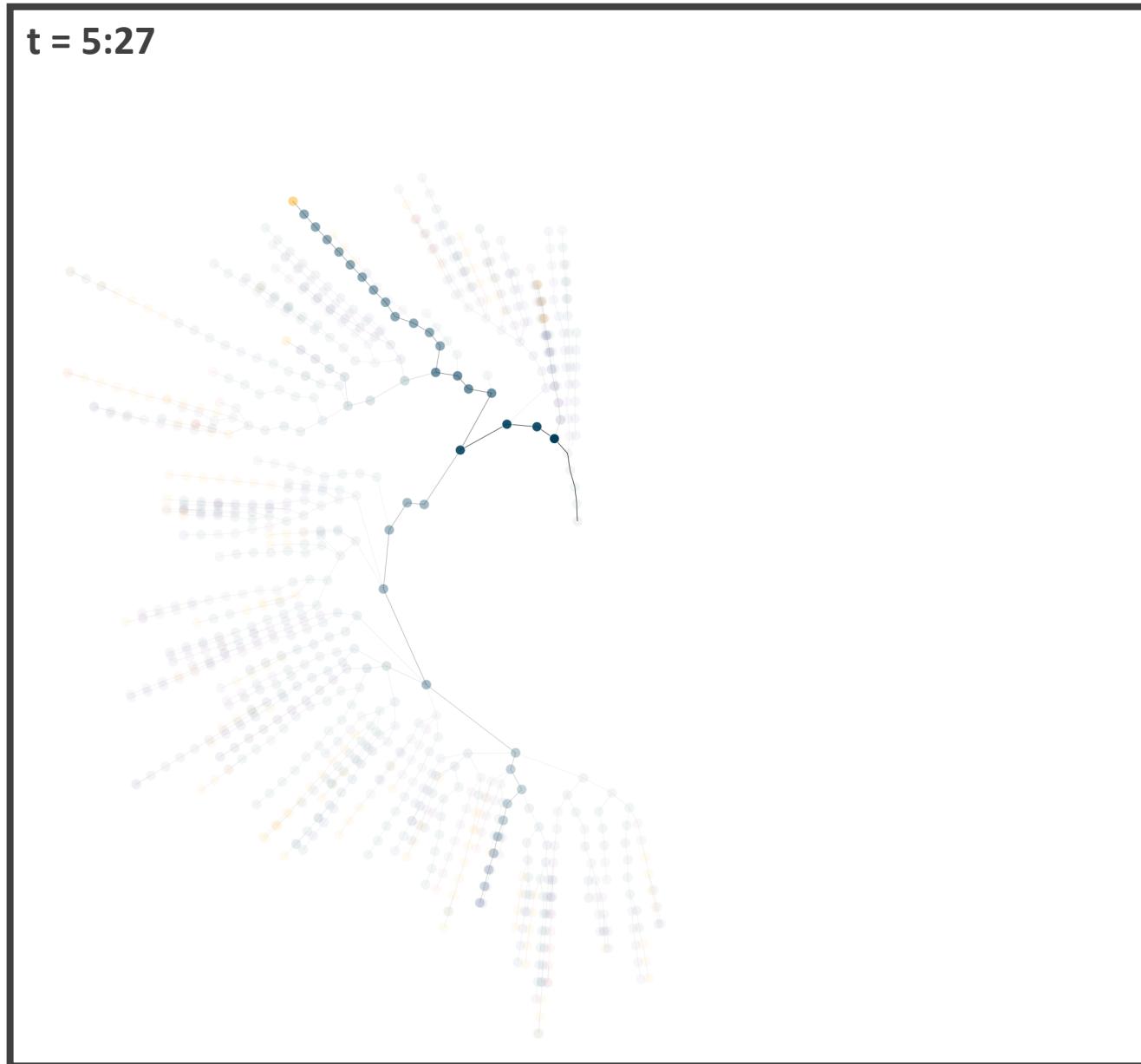
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Strategy	Probability
Bio Terran	30%
Econ Mech	14%
Aggressive Mech	29%
Air Aggression	3%
Mixed Air Control	6%
Tank Air Control	6%
Mobile Mech	14%
Protoss	0%



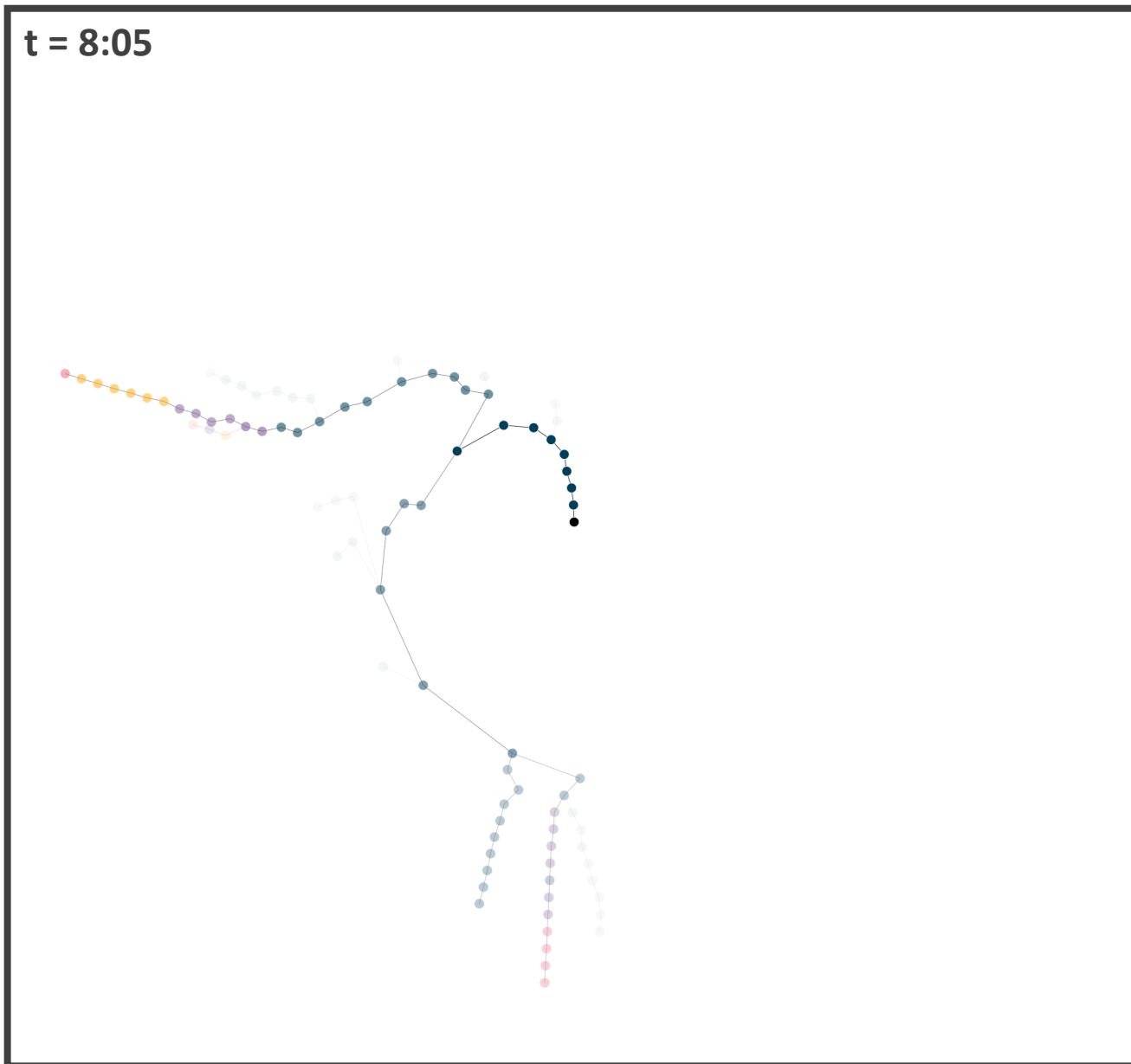
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0:00	No Observation
2:40	1x SCV
5:27	2x Factories
8:05	3x Goliaths
8:41	1x Starport
8:44	2x Vultures

Strategy	Probability
Bio Terran	10% 
Econ Mech	21% 
Aggressive Mech	8% 
Air Aggression	0% 
Mixed Air Control	~0% 
Tank Air Control	1% 
Mobile Mech	60% 
Protoss	0%



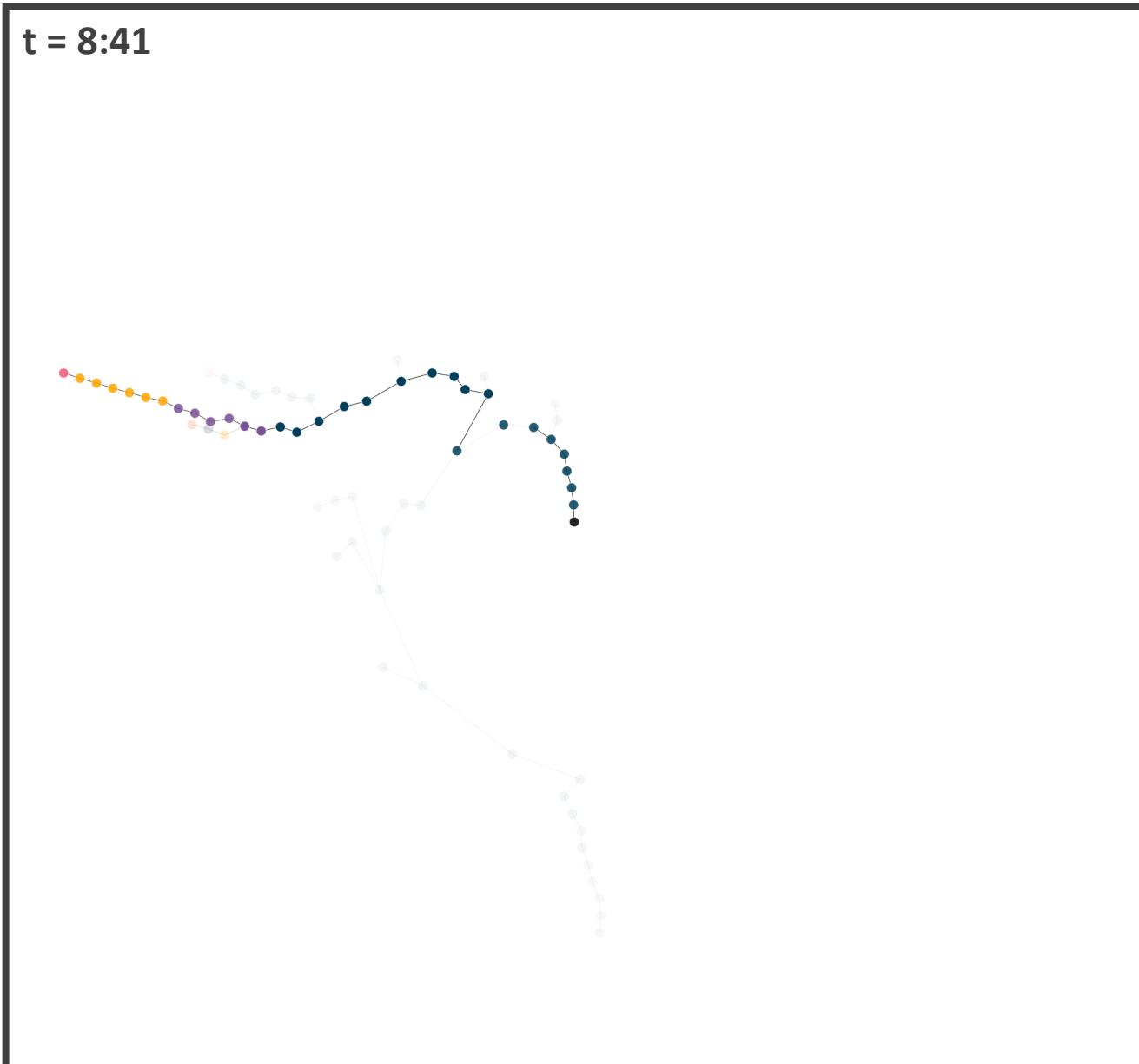
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Strategy	Probability
Bio Terran	↑ 22%
Econ Mech	↓ 0%
Aggressive Mech	↓ ~0%
Air Aggression	0%
Mixed Air Control	↑ 69%
Tank Air Control	↑ 8%
Mobile Mech	↓ 0%
Protoss	0%



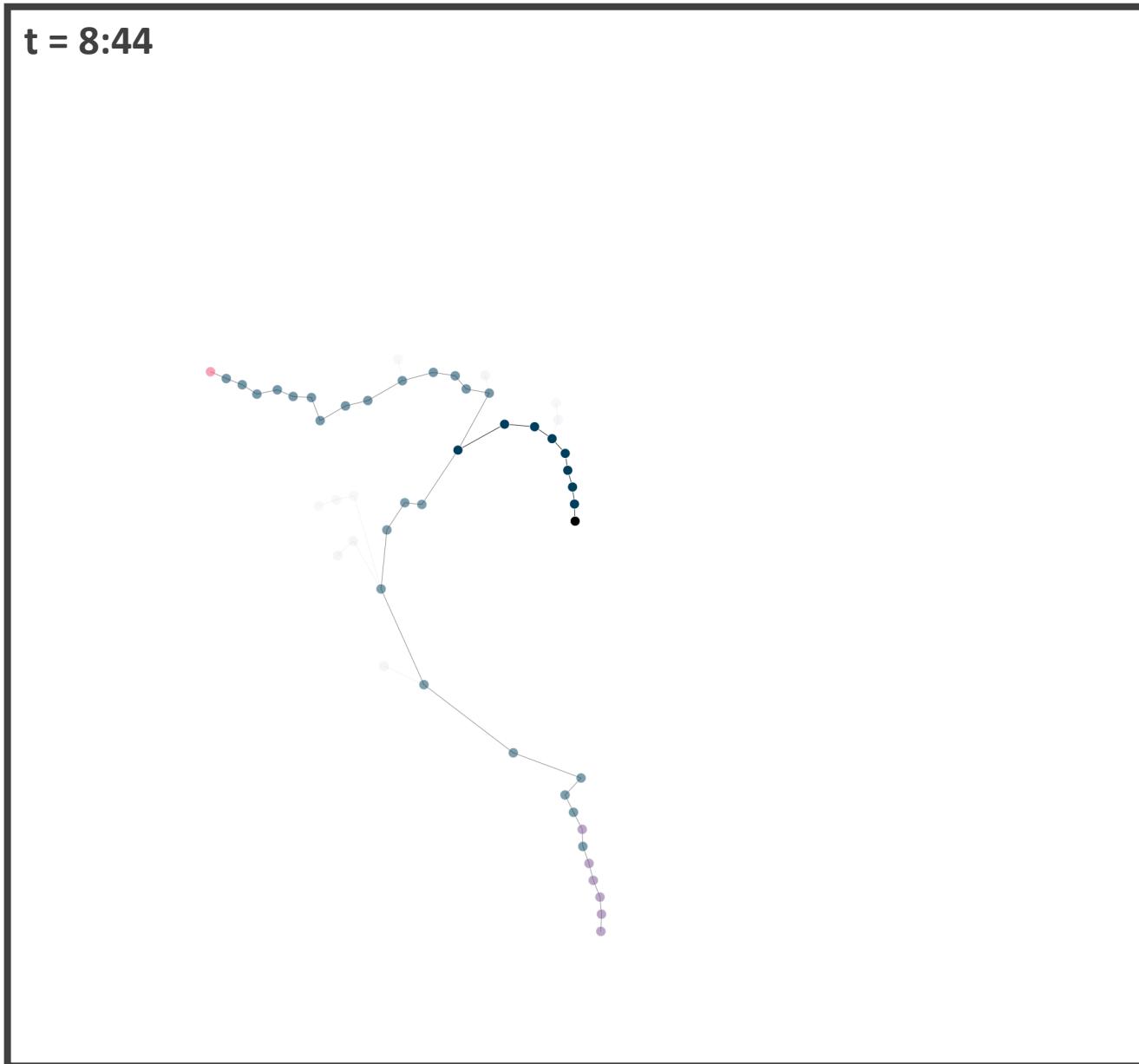
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Strategy	Probability
Bio Terran	0% 
Econ Mech	0%
Aggressive Mech	~0%
Air Aggression	0%
Mixed Air Control	84% 
Tank Air Control	16% 
Mobile Mech	0%
Protoss	0%



Time	Observation
0:00	No Observation
2:40	1x SCV
5:27	2x Factories
8:05	3x Goliaths
8:41	1x Starport
8:44	2x Vultures

Strategy	Probability
Bio Terran	0%
Econ Mech	0%
Aggressive Mech	48%
Air Aggression	0%
Mixed Air Control	52%
Tank Air Control	0%
Mobile Mech	0%
Protoss	0%



# Conclusion

## Tree Data Structure

- Adjust probabilities for many outcomes with a single calculation
- Reflects an intuitive view of StarCraft strategy

## Bayesian Statistics

- Update historical strategy frequencies for in-game knowledge
- Tell us what in-game observations are important

# Contact Information

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