

Predicting Deliveries in a Labor and Delivery Unit



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Intro and Motivation

Intro to Labor and Delivery

1. Labor and Delivery units are considered urgent care units because deliveries are immediate and often critical. The Duke Birthing Center (DBC) performs high risk deliveries, so ensuring proper staffing levels in these units is necessary for successful and safe deliveries.

GOAL

Predict the number of deliveries at the Duke Birthing Center to aid in staffing

2. If we have a good prediction of the deliveries coming in, we can staff to demand!

Complexity

There are two different types of women that deliver at the DBC.

The Knowns

Women that got prenatal care within the Duke system

The Unknowns

Women that are not in the Duke system at all

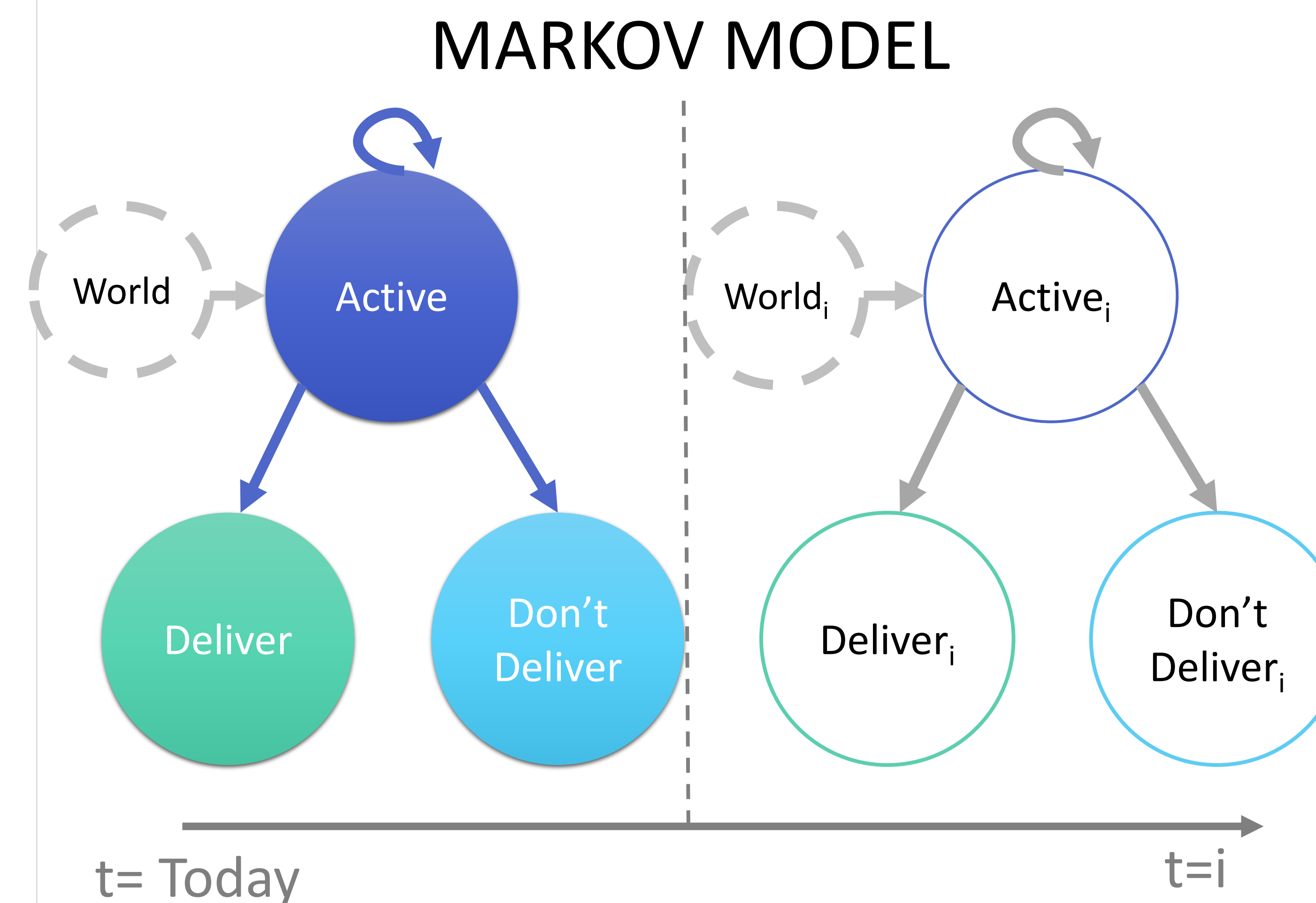
- We know the expected delivery date of the "Knowns". But pregnancies in the system do not always result in deliveries in the DBC. Some moms may deliver at other hospitals, at home, etc.
- Moms also may deliver early, or late
- **We don't know when the Unknown moms come, or in what volume**

Methods

At time i

$$\text{Deliveries}_i = \text{Knowns}_i + \text{Unknowns}_i$$

I. Finding the Knowns_i



Markov States

1. **Active** Pregnancy, A_i
(Based on Expected Delivery Date)
2. **Deliver**, Y_i
3. **Don't Deliver**, N_i

$$\text{Knowns} = Y_i$$

Methods (continued)

II. Finding the Unknowns_i

Plan to use a Regression to predict number of deliveries that are "Unknown" at Time i

Input variables at time i : C-sections scheduled, Day of Week, Month, nurses staffed, residents on shift, beds available, Number of deliveries that were "Knowns"-actual, Number of deliveries that were "Knowns"-predicted,

Output variables at time i : Number of deliveries from the "Unknown" cohort of moms

Discussion

Knowns Model

- Other transition states to consider?
- How do we best address new moms becoming "active" that are coming from the world?

Unknowns Model

- Choosing the correct regression model
- Expanding the number of input variables

Data

- How do we best address a changing working expected delivery date?
- How granular should time i be considering the practicality of this project's use in operations

Next Steps

Finalize Models

Pull Data

Run and Test for Accuracy

