Machine learning mistakes

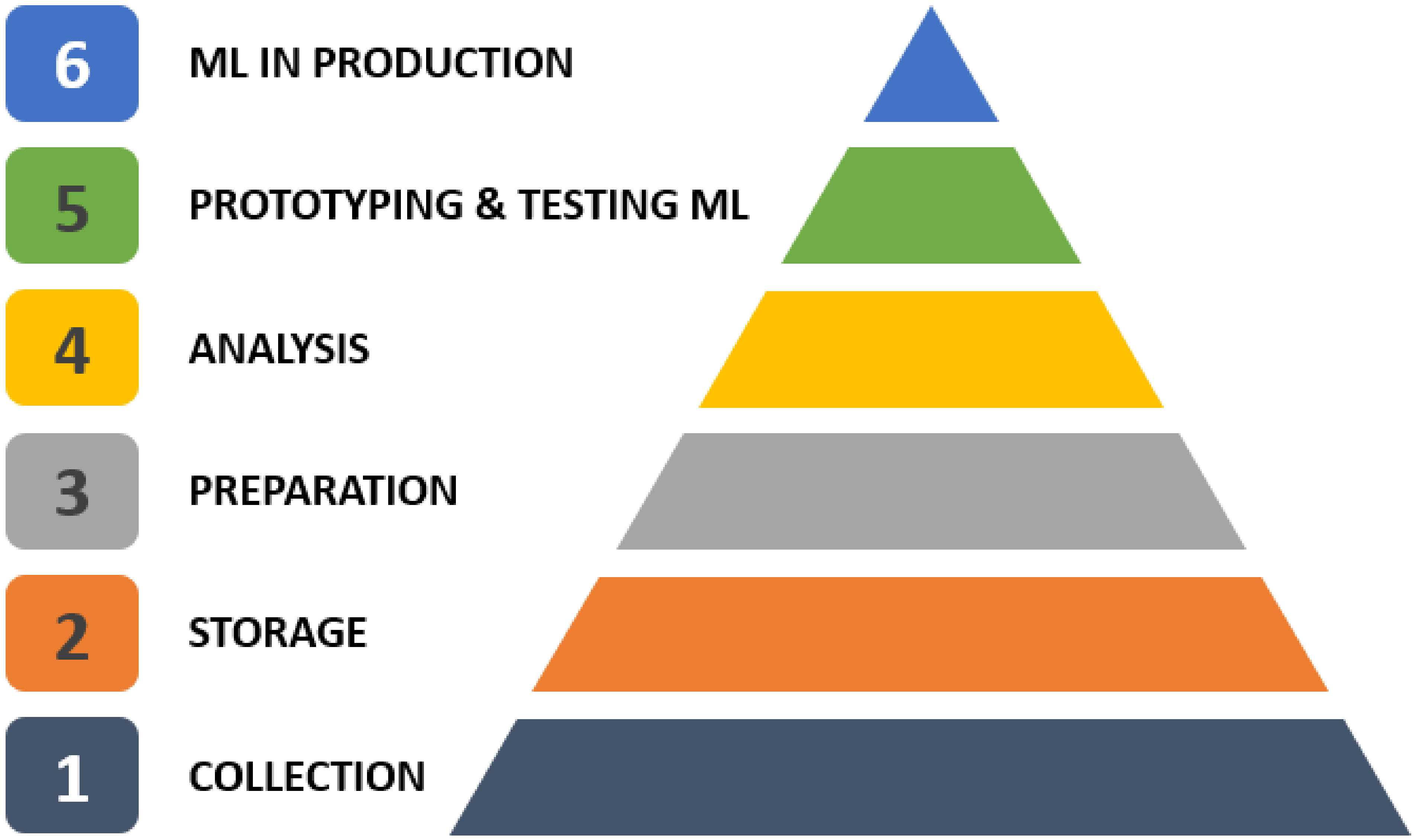
MACHINE LEARNING FOR BUSINESS

Karolis Urbonas
Head of Machine Learning & Science, Amazon

Mistakes

- Machine learning first
- Not enough data
- Target variable definition
- Late testing, no impact
- Feature selection

Machine learning first



Not enough data

Target variable definition

- What are we predicting?
- Can we observe it?
    - Contractual churn - customer terminated the premium credit card
    - Non-contractual churn - customer started using another grocery store
- In-depth analysis
- Business field expertise

Feature selection

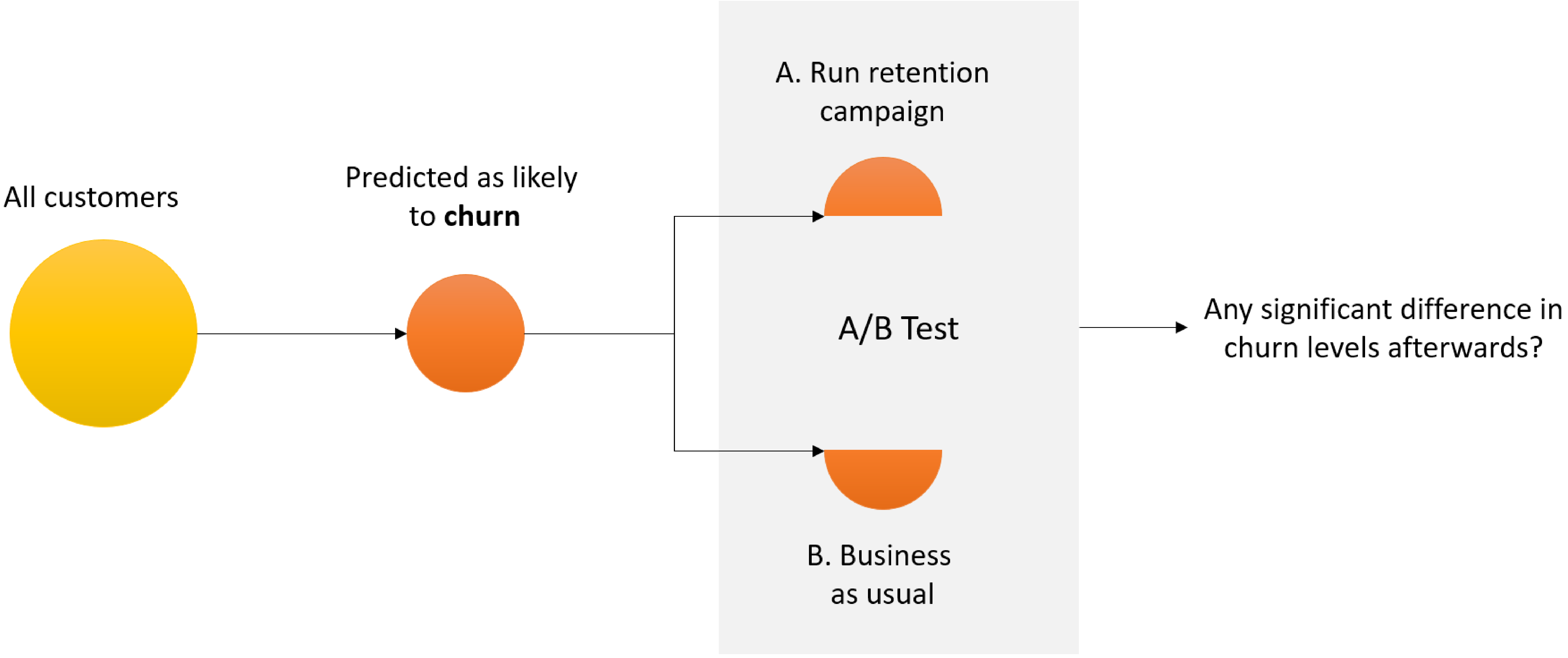
Inference (**what affects** the target variable?)

- Choose variables that you can control (website latency, price, delivery, customer service etc.)
- Business has to be involved in feature selection

Prediction (can we **estimate** the target variable value in the future?)

- Start with readily available data
- If model performance is OK, test it
- Introduce new features iteratively

Late testing, no impact



Let's practice!

MACHINE LEARNING FOR BUSINESS

Communication management

MACHINE LEARNING FOR BUSINESS

Karolis Urbonas
Head of Machine Learning & Science, Amazon

Working groups

Schedule recurring meetings to track progress and define the following:

- Define the business requirements
- Review machine learning model **and** business products
- Inference vs. prediction
- Baseline model results & outline model updates
- Market testing
- Production

Business requirements

1. What is the business **situation**?
   - *Churn rate has started increasing*
2. What is the business **opportunity** and how big is it?
   - *Reduce churn from X% to Y%*
3. What are the business **actions** we will take?
   - *Run retention campaigns targeting customers at risk*

Machine learning products

- What ML **products** does the business needs?

- **Example 1** - Predict churn. Business wants 1) inference into drivers of the churn updated quarterly, and 2) daily customer classification into: lost customers, customers at risk, no risk

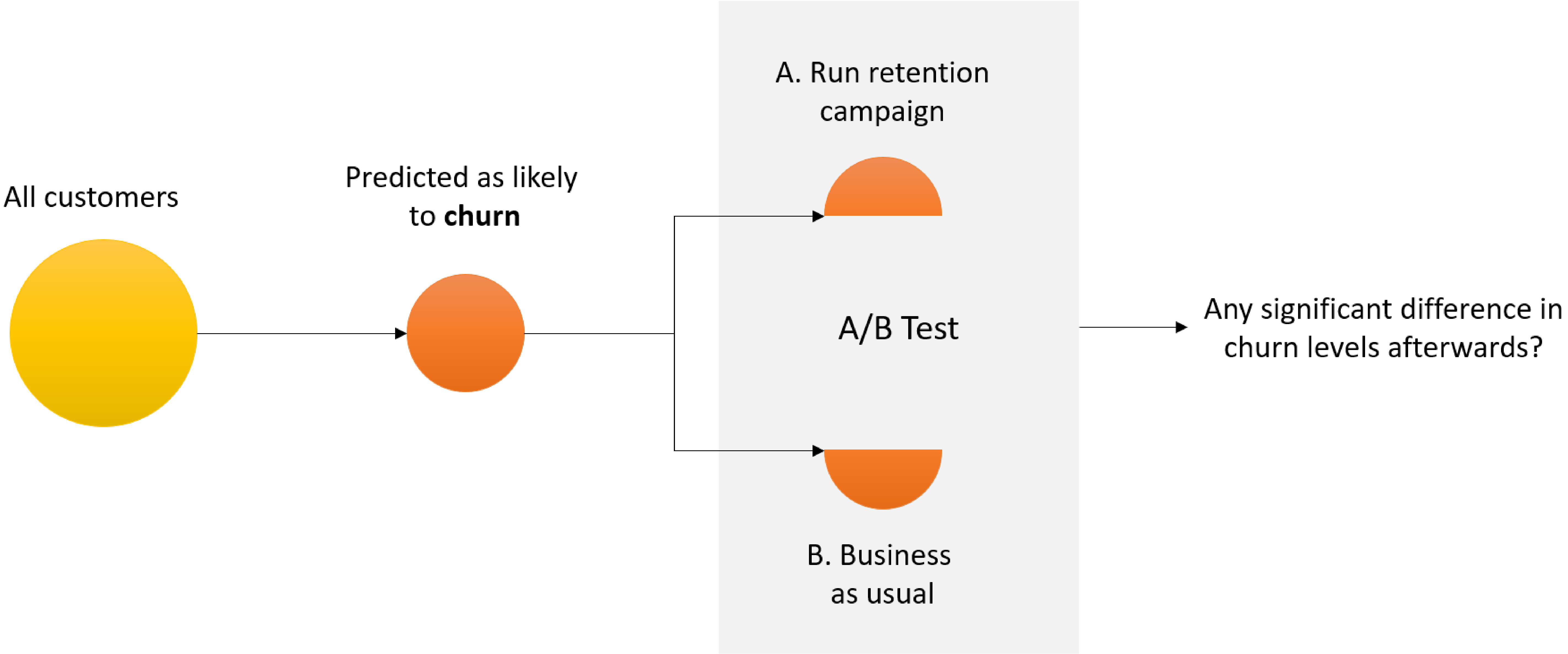
- **Example 2** - Fraud prediction. Business wants 1) inference into strong indicators of churn, and 2) real-time list of very risky transactions for manual review and medium risk ones for additional data request

Model performance and improvements

Identify what is the tolerance for model mistakes (remember - all models are wrong):

- **Classification**
  - Which class is more expensive to mis-classify?
  - Example - it's likely more expensive to mis-classify fraud as non-fraud than vice versa
- **Regression**
  - What is the error tolerance for prediction?
  - Example - in demand prediction the company will have to buy more inventory than needed if the model error is very high

Market testing



Machine learning in production

- Are test results delivering consistent positive improvements?
- Is the model stable enough?
- Do we have systems and tools where the model be integrated to?

Let's practice!

MACHINE LEARNING FOR BUSINESS

Machine learning in production

MACHINE LEARNING FOR BUSINESS

Karolis Urbonas
Head of Machine Learning & Science, Amazon

datacamp

Production systems

Production system is live, customer facing and business critical.

- Customer Relationship Management (CRM)
- Fraud detection system
- Online banking platform
- Autonomous cars

CRM

Production system - Customer Relationship Management (CRM)

Example - predicted churn triggers automatic emails

Fraud detection system

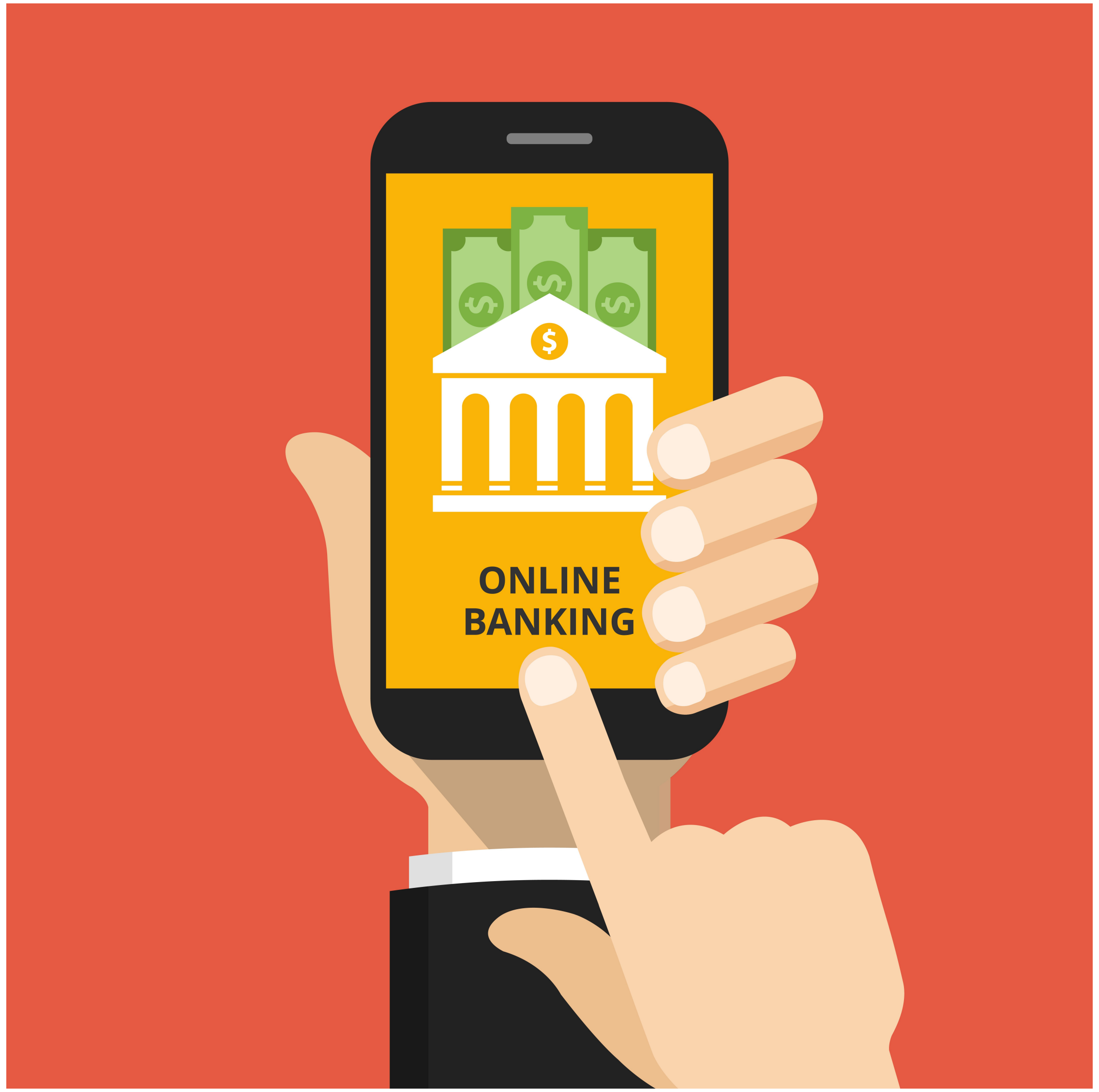
Production system - fraud detection system

Example - predicted fraud probability automatically triggers transaction block and requests a manual review

Online banking system

Production system - online banking platform

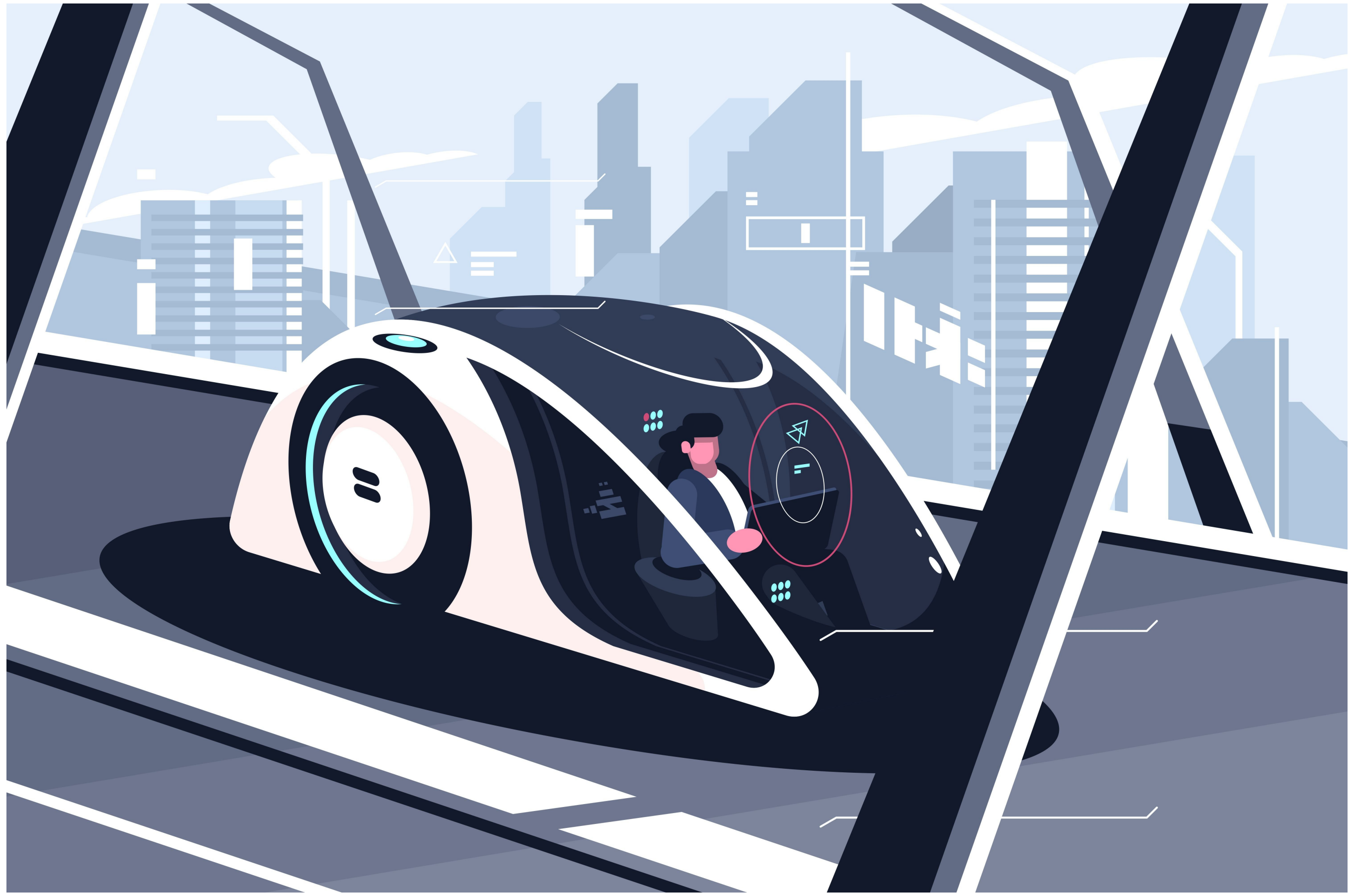
Example - recommended products shown on the customer's online banking profile



Autonomous cars

Production system - autonomous cars

Example - predicted collision kicks off automatic initiation of brakes and collision avoidance steps



Staffing

Prototype ML

- Data Scientists
- ML Engineers

ML in production

- Software engineers
- Data Engineers
- Infrastructure owners

Launch, tracking and feedback

1. Murphy's law
2. Launch to a small subset of customers
3. Track results and if they're consistent
4. Track performance, stability, customer feedback
5. Scale up
6. Repeat 3, 4, 5

Let's practice!

MACHINE LEARNING FOR BUSINESS

Wrap-up

MACHINE LEARNING FOR BUSINESS

Karolis Urbonas

Head of Machine Learning & Science, Amazon

Thank you!

MACHINE LEARNING FOR BUSINESS