# Prepare for the Gradient Boosting tutorial

- Download the notebook:

http://bit.ly/2XXbZo5 OR http://bit.ly/2NOmLsU

- Install the libraries:

pip install catboost shap ipywidgets sklearn

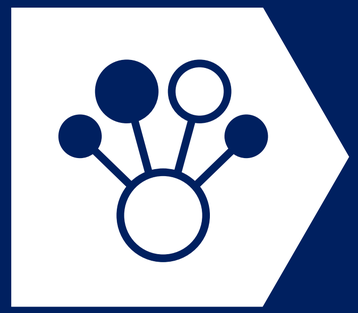
jupyter nbextension enable --py widgetsnbextension

# Prepare for the Gradient Boosting tutorial

- Download the slides:

https://github.com/catboost/catboost/tree/master/slides/2019_pydata_london

# Mastering Gradient Boosting with CatBoost



# CatBoost

Gradient Boosting Library

# Plan

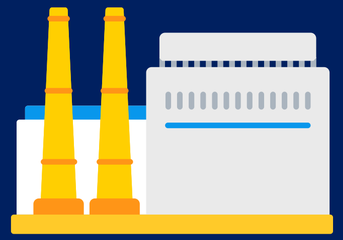
- Intro to Gradient Boosting
- Intro to CatBoost and benchmarks
- Tutorial
- Next releases

# Gradient Boosting

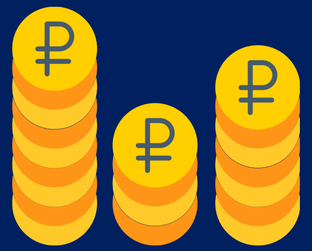
- Best solution for heterogeneous data
- Easy to use
- Works well for small data

# Applications

Medicine



Industry

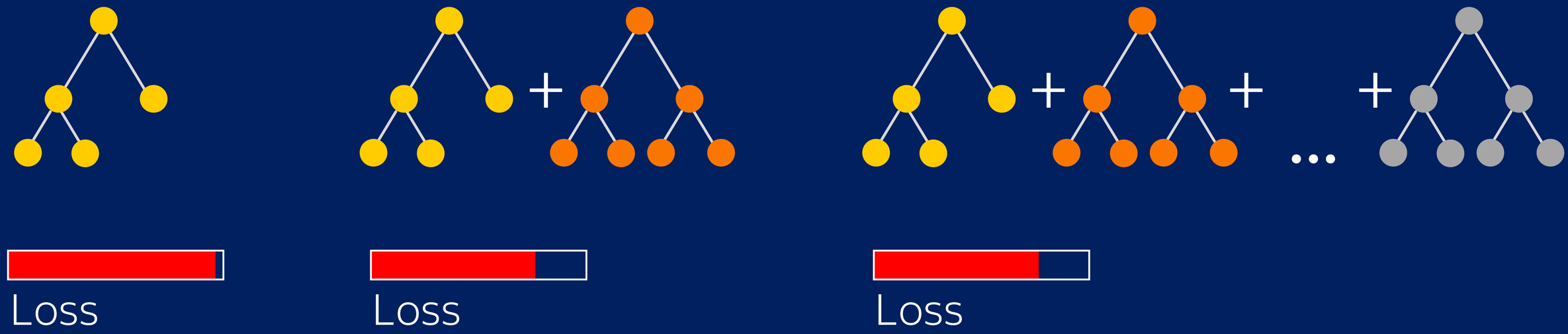


Finance

Music and video recommendations

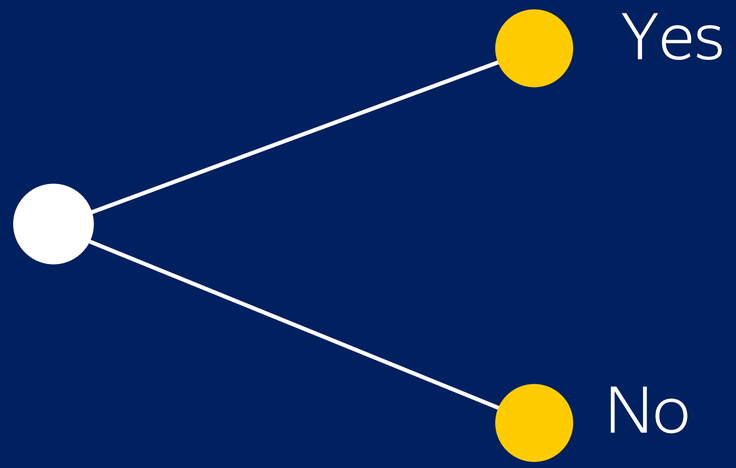
Sales prediction

# Gradient boosting



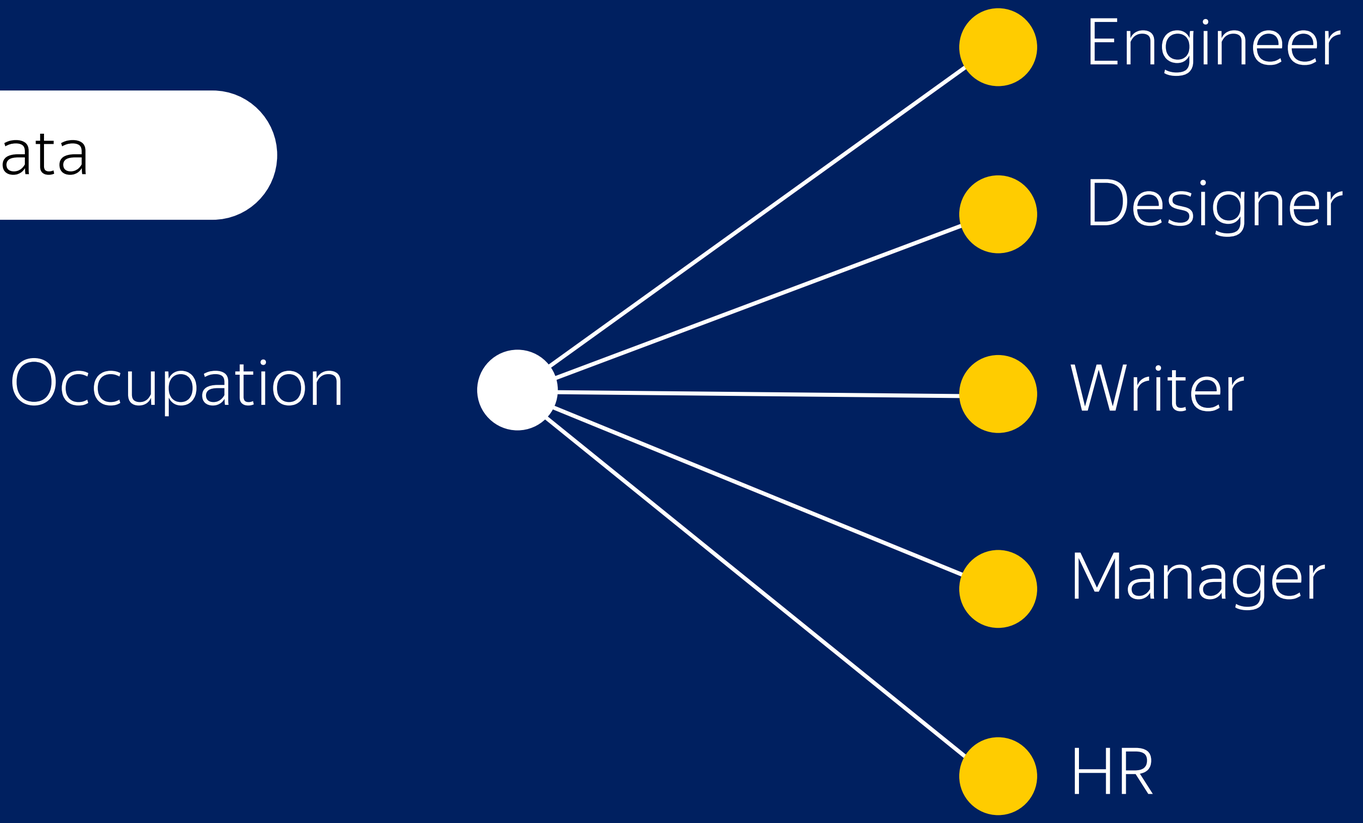
# Numerical features

Salary > 30 000



# Categorical features

Categorical data



# CatBoost advantages

- Good quality with default parameters
- Sophisticated categorical features support
- Model analysis tools

# Algorithm comparison

| | CatBoost | LightGBM | | XGBoost | | H2O | |
|---|---|---|---|---|---|---|---|
| Adult | 0.269741 | 0.276018 | + 2.33 % | 0.275423 | + 2.11% | 0.275104 | + 1.99% |
| Amazon | 0.137720 | 0.163600 | + 18.79 % | 0.163271 | + 18.55% | 0.162641 | + 18.09% |
| Appet | 0.071511 | 0.071795 | + 0.40 % | 0.071760 | + 0.35% | 0.072457 | + 1.32% |
| Click | 0.390902 | 0.396328 | + 1.39 % | 0.396242 | + 1.37% | 0.397595 | + 1.71% |
| Internet | 0.208748 | 0.223154 | + 6.90 % | 0.225323 | + 7.94% | 0.222091 | + 6.39% |
| Kdd98 | 0.194668 | 0.195759 | + 0.56 % | 0.195677 | + 0.52% | 0.195395 | + 0.37% |
| Kddchurn | 0.231289 | 0.232049 | + 0.33 % | 0.233123 | + 0.79% | 0.232752 | + 0.63% |
| Kick | 0.284793 | 0.295660 | + 3.82 % | 0.294647 | + 3.46% | 0.294814 | + 3.52% |

Logloss

# Speed

- Training on CPU
- Training on GPU
- Prediction speed

# CPU: Comparison with other libraries

- Parameters:

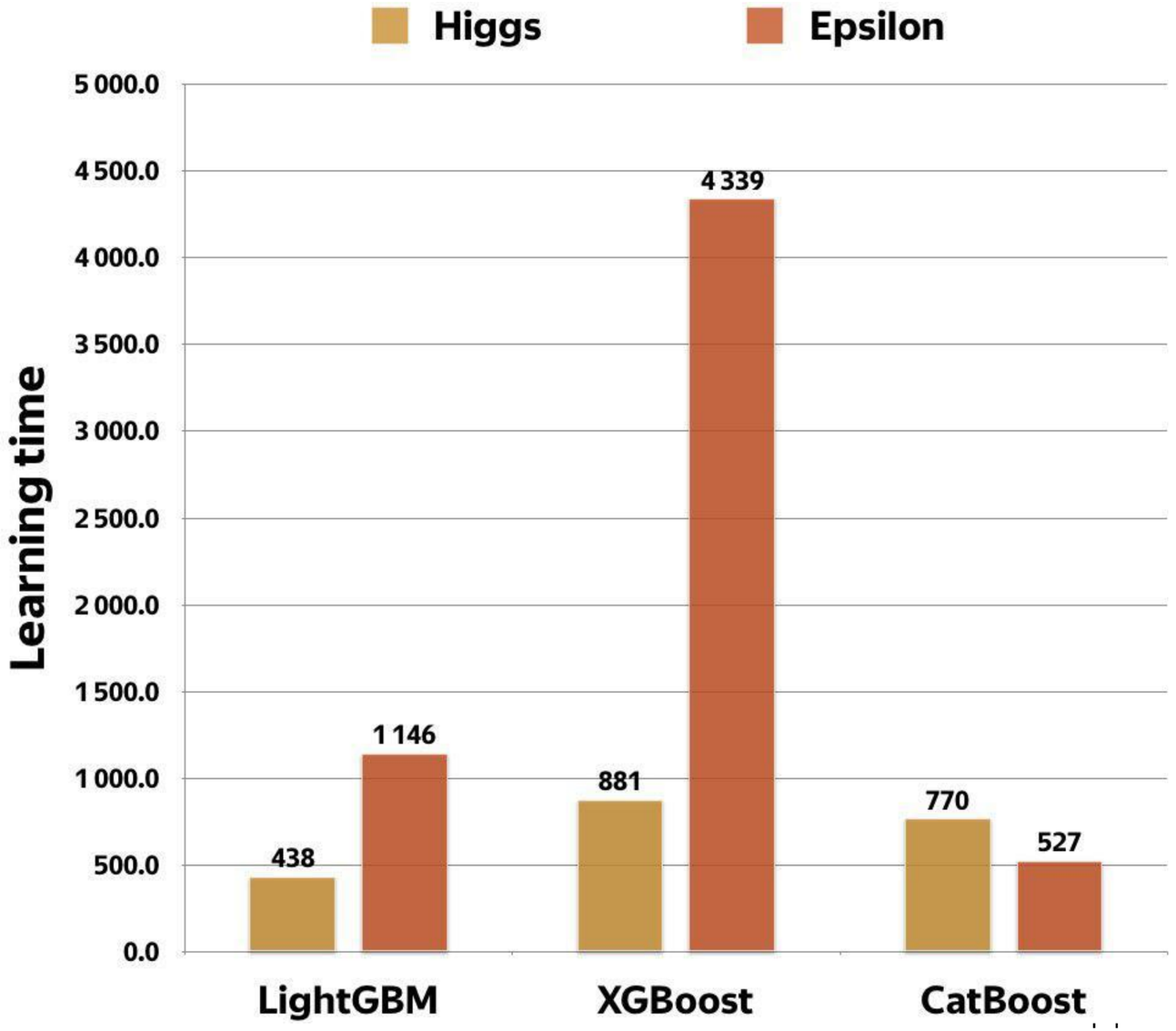
128 bins, 64 leafs, 400 iterations

- Higgs:

800 features, 4M samples

- Epsilon:

2000 features, 400K samples



# GPU: Comparison with other libraries

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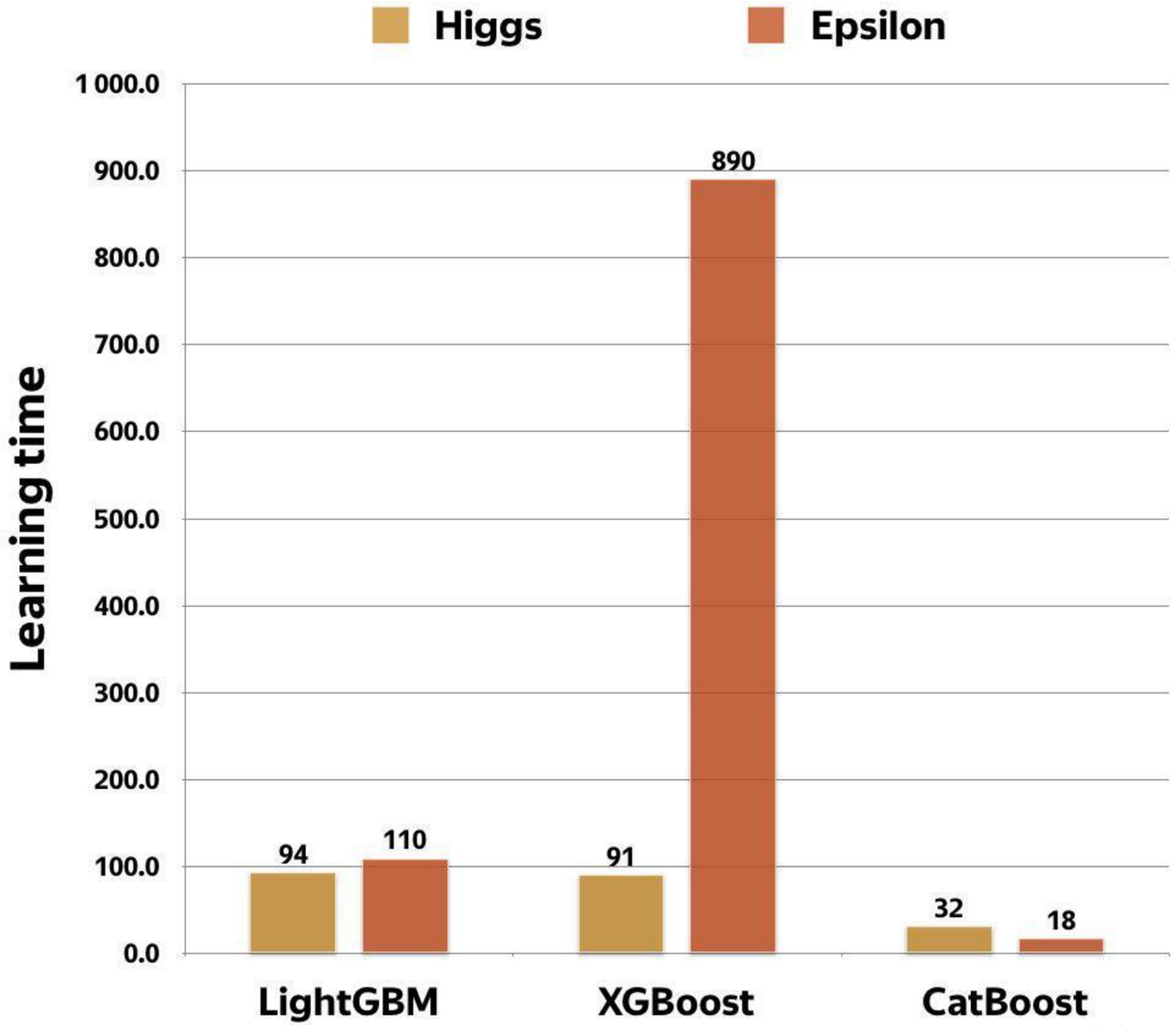
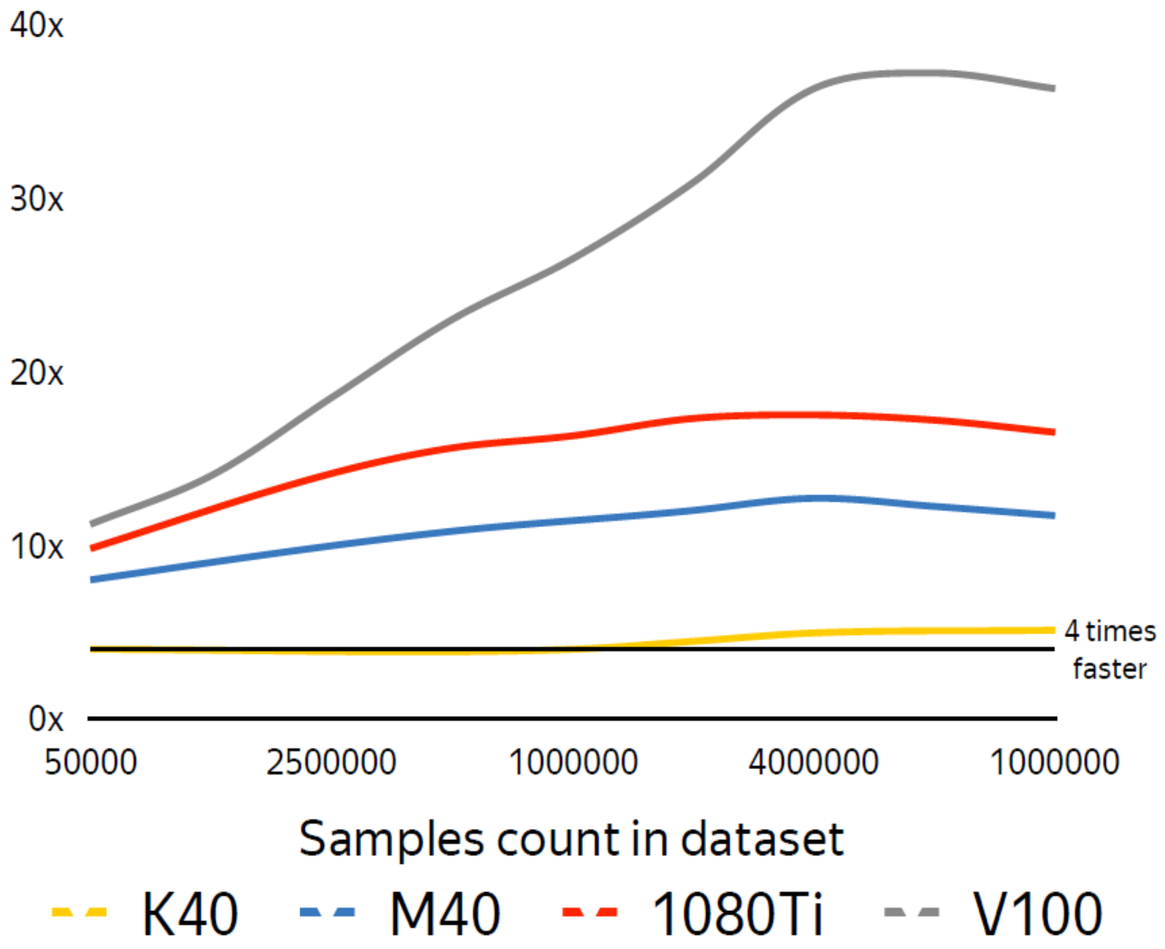
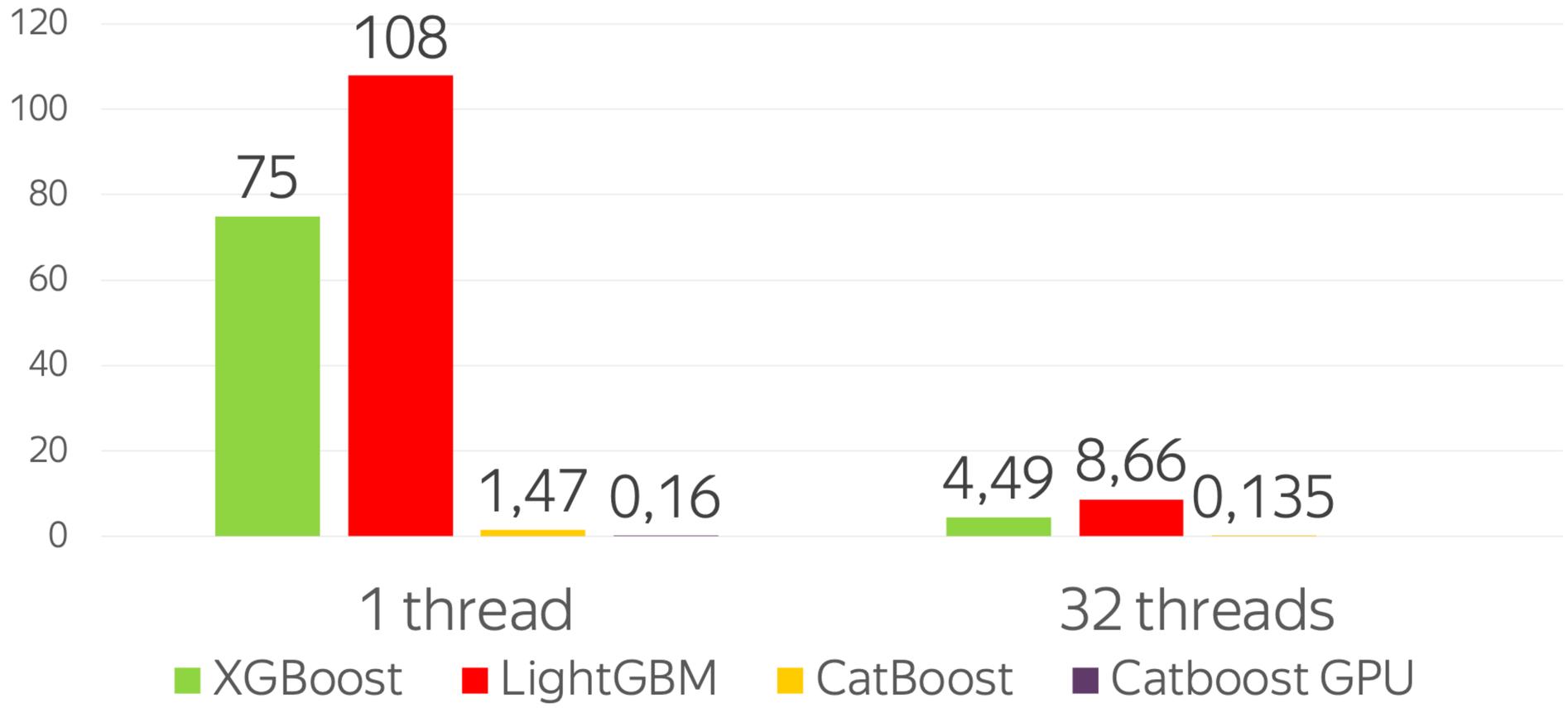


# CPU vs GPU

- Dual-Socket Intel Xeon E5-2660v4 as baseline
- Several modern GPU as competitors
- Dataset: 800 features



# Prediction time



# Tutorial data

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# Coming soon

- Sparse data support
- New types of features
- New methods for model and analysis
- More metrics
- Training speedups

- catboost.ai
- twitter.com/CatBoostML
- Telegram:

t.me/catboost_en

- Slack:

ods.ai => slack (30k people community) => #tool_catboost

- Slides:

https://github.com/catboost/catboost/tree/master/slides/2019_pydata_london

# Questions?

Anna Veronika Dorogush

Head of CatBoost team