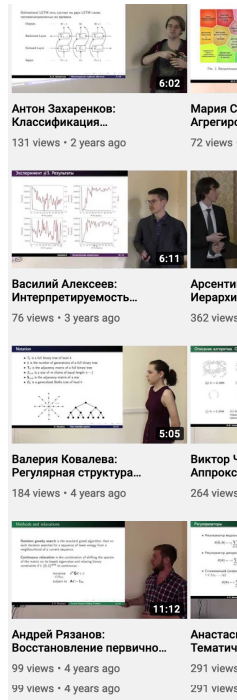
My first scientific paper, BS3-course

Goal to learn how to convey research ideas in precise and clear way

Result is a research paper submitted to a peer-reviewed journal

Small teams, 3-4 members

- Student writes a paper, performs a computational experiment, presents results
- Consultant (PhD candidate) promptly helps the student with technology and mathematics
- Expert (Prof.) states application problem, delivers data, answers to challenges



Scedule

- It starts February 6^{th}, ends May 7^{th}, goes 13 weeks
- A task takes one week (up to 20 hours), it is graded weekly

Now 21 group are working. Over 300 student projects were made.

YouTube: https://goo.gl/qFSHQW

In 2019-2020 Awarded by Yandex for his significant impact in scientific community development in CIS-countries

To start an applied project an expert and an analyst set

1. Project goal (the expected result of development)
   main purpose of research
2. Project application (how the project result will be applied)
   environment of measures and impacts
3. Historical data description (data formats and timing)
   algebraic structures of data
4. Quality criteria (how the project quality is measured)
   error function
5. Feasibility of the project (how to prove the project feasibility, list possible risks) error analysis

How long the model lives after being put on operation? What replaces it after?

Problem statement for machine learning

Formal problem statement, an analyst has to set

1) an algebraic structure for the dataset from measurements
2) a data generation hypothesis from 1)
3) a model, or a mixture from 2)
4) an error function (quality criteria with restrictions) from 2)
5) an optimization algorithm from 3) and 4)

The result of the model construction is a Cartesian product

$$\{\textbf{models} \times \textbf{data sets} \times \textbf{quality critea}\}.$$

Def: *Big data rejects the i.i.d. (independent and identically distributed random variables) data generation hypothesis from 2). It requests a mixture model.*

Analyst creates a model for expert to put it to operation