Machine Learning
Dmytro Fishman (dmytro.fishman@ut.ee)
Who am I? Dmytro (Dima) Fishman dmytro.fishman@ut.ee

Education

BSc (2007 - 2011)

MSc (2011 - 2013)

PhD candidate (2013 - 2020(?))

Teaching experience

Assistant of Data Science

Instructor of Machine Learning course

Instructor of Advanced Machine Learning and Time Series Modelling course
BioInformatics and Information Technology research group

https://biit.cs.ut.ee/
Computer Vision on micro level
Introduction to self-driving
Autonomous Driving Lab
- cooperation between University of Tartu and Bolt
Autonomous Driving Lab - cooperation between University of Tartu and Bolt
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Group 2 (Monday @ 12:15, 1008)  
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Behrad Moeini  
Group 6 (Tuesday @ 16:15, 2039)  
behrad@ut.ee
Machine Learning
(course roadmap)
Overview of ML
Supervised Learning
Unsupervised Learning
Performance metrics
Deep Learning
Ensemble learning
Other

Overview of ML
Course organisation
Hierarchical clustering
K-means
T-SNE
UNAP
PCA
Data preprocessing
Cross Validation
Algorithm
Model selection
Model implementation
Data
Classification vs regression
Nearest Neighbour Classifier
Linear regression
Decision trees
Overfitting
Tran/val split
Deep Learning
Artificial neuron
Forward path
Activation Functions
Gradient descent
Backpropagation algorithm
Vanishing Gradients
Convolutional NNs
Accuracy
MSE & RMSE
Recall, precision
F1-score
Confusion matrix
Confusion matrix
RSE & RMSE
ROC & AUC

Basic ensembling
Bagging
Random Forest
Boosting
XGBoost
Stacking & Blending
Accuracy
Recall, precision
F1-score

Regularisation
L1 & L2 regularisation
Training loop
Vanishing Gradients
Convolutional NNs

Other

- Supervised Learning
- Unsupervised Learning
- Deep Learning
- Regularisation
- Ensemble learning
- Performance metrics
- Other
Now you are ready for real-life tasks
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Now you are ready for real-life tasks
Supervised Learning
Unsupervised Learning
Performance metrics
Deep Learning
Ensemble learning
Other

Nearest Neighbour Classifier
Linear regression
Decision trees
Overfitting
Train/val split
Cross Validation
Algorithm
Model selection
Model implementation
Data preprocessing
Classification vs regression

K-means
T-SNE
UNAP
PCA
Data preprocessing
Backpropagation algorithm
Gradient descent
Vanishing Gradients
Convolutional NNs

DBSCAN
Hierarchical clustering
DBSCAN
K-means
T-SNE
UNAP
PCA
Data preprocessing
Backpropagation algorithm
Gradient descent
Vanishing Gradients
Convolutional NNs

Artificial neuron
Forward path
Activation Functions
Gradient descent
Backpropagation algorithm
Vanishing Gradients
Convolutional NNs

Neural networks
Deep Learning
Artificial neuron
Forward path
Activation Functions
Gradient descent
Backpropagation algorithm
Vanishing Gradients
Convolutional NNs

Algorithm
Model selection
Model implementation
Data preprocessing
Classification vs regression

Accuracy
MSE & RMSE
Recall, precision
F1-score
Confusion matrix
ROC & AUC

Six homeworks (10 points each)

Paper review (10 points)

Now you are ready for real-life tasks
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Now you are ready for real-life tasks
How this course will work (general information)
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• All deadlines are **hard deadlines**, but you have **6 late days** to submit without **penalty**

• Penalty is **-20%** from the max grade for the assignment for each extra late day.

• Attendance is **not compulsory**

• There is **no exam** (hurrah!)
How this course will work (grading)

• Max 100 points

• **6 homeworks, 10** points each (60 points)  
  (plenty of **bonus points** will be available)

• **1 paper summary** (10 points)

• **Project** (30 points)

• As usual **A** starts from 91, **B** from 81 etc.
# Deadlines

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Date of assignment</th>
<th>Deadline (midnight 23:59)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW1</td>
<td>Sep 7</td>
<td>Sep 20</td>
</tr>
<tr>
<td>HW2</td>
<td>Sep 21</td>
<td>Oct 4</td>
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<tr>
<td>HW3</td>
<td>Oct 5</td>
<td>Oct 18</td>
</tr>
<tr>
<td>Paper summary</td>
<td>Oct 12</td>
<td>Oct 26</td>
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<tr>
<td>HW4</td>
<td>Oct 19</td>
<td>Nov 1</td>
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<td>HW5</td>
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<td>Nov 22</td>
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<tr>
<td>HW6</td>
<td>Nov 23</td>
<td>Dec 6</td>
</tr>
<tr>
<td>Project</td>
<td>TBA</td>
<td>Dec 14</td>
</tr>
</tbody>
</table>

*All deadlines are subject to change, check out Piazza posts and website for updates*
How this course will work (communication)

• **Course webpage:**
  - https://courses.cs.ut.ee/2020/ml/fall

• **Course forum** in Piazza:
  - https://piazza.com/ut.ee/fall2020/mtat03227

• Your current grades will be available in a separate google spreadsheet
How this course will work (homeworks)

• 6 homeworks (10 points each) in Colaboratory

• Per task feedback from the TAs

• Export .ipynb files from Colaboratory and submit via the course

• Generally, if you submit 1 minute late, it is considered 1 day over the deadline, mind you step.
How this course will work (paper review)

- **Learn** to perform in **depth review** of someone else’s work

- We will provide a **list of papers** to choose from

- Summarise the main messages, try to grasp the main idea, its pros and cons

- **Up to 2 pages**
How this course will work (project)

- **Learn** ML from trenches
- Teams of size **4 - 5 students**
- We will announce a call for projects among practitioners
- Also you will be given an opportunity to propose your idea
- You will present an intermediate progress in November
- The final presentation will be held in December (potentially 14th of Dec)
How this course will work (COVID19)

Lectures | Practice sessions
How this course will work (COVID19)

Lectures
Solely online

Practice sessions
How this course will work (COVID19)

Lectures

Solely online

Practice sessions

+ Offline sessions
How this course will work (COVID19)

Lectures

Solely online

Practice sessions

+ Offline sessions

All lectures and one practice session per week will be recorded and uploaded to the course website
How this course will work (COVID19)

If you attend practice sessions in person, please register yourself here: shorturl.at/byAY7
How to pass this course

• Be kind and nice person

• Get at least **51 point** overall

• Get at least **50%** for each type of assignment
  (at least **30 points** from homeworks, **5** from summary and **15** from project)
In this course we will practice student-centred approach.
Code of conduct

We value the involvement of everyone in the community. We are committed to creating a friendly and respectful place for learning, teaching and contributing. All participants in our classes are expected to show respect and courtesy to others.
Plagiarism is not tolerated

First time caught, we subtract exercise points from your homework
Second time - notification to Dean’s office
We actually will run checks to see if you respect this.