Phase I) Problem and Workflow Definition (Due on)

Trajectory Prediction on ETH/UCY

- *Give an introduction and motivation for your problem (**Introduction**)*

In the modern world, there is a task of predicting the trajectory of movement of people. This task can arise when using self-driving cars, social robots, since they need to make decisions by interacting with pedestrians. Even though people solve this problem easily, for machines it remains a non-trivial task.

- *Give a problem description and definition (**Introduction**)*

When pedestrians form their trajectory, they can be influenced by many factors. We distinguish the following categories:

1) other people around (their coordinates and speeds, appearance) and the external environment (landscape, weather, obstacles on the way)
2) the goal of a person's walk - but it is known only to the person himself, and not to our model
3) personal qualities of a person
4) randomness in decision making

There is also should be taken into account such a factor as social norms. For example, personal space around people, which depends on the density of crowds around.

We will work with the well-known ETH and UCY datasets, which represent sets of images with pedestrian routes.

We will consider the movement of people as a task of predicting sequences (coordinates and speeds). But also take into account the influence of adjacent sequences.

Problem description: We want to predict the movement of people, knowing their movement for a certain previous period of time. We will also take into account the influence of the external environment.

- *Formulate a research goal and research questions (**Introduction**)*

Target (*we should chose?*):

1) Build a model (social GAN?) that predicts the movement of pedestrians and get the ADE, FDE metrics.
2) Improve ADE, FDE motion prediction metrics.
3) Define how many and what factors affect the movement of a pedestrian.

- *Start a first related work search and provide your team with initial resources (**Related work**)*

This problem has already been studied in many works earlier:

Social LSTM: Human Trajectory Prediction in Crowded Spaces, 2016

Social GAN: Socially Acceptable Trajectories with Generative Adversarial Networks, 2018

From Goals, Waypoints & Paths To Long Term Human Trajectory Forecasting, 2020

For example, in work (1) - one of the first to apply neural networks to a task - interpersonal interaction is taken into account using the "Social pooling layer". In work (2), the "Socially-Aware GAN" method was developed. In (3), with the best ADE value so far, the Y-net method based on "heatmaps" was developed.