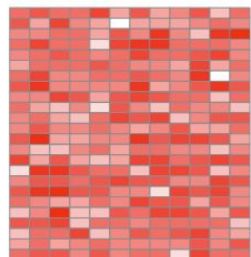
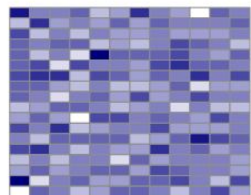


DirectPred: Standard Fully Connected Networks

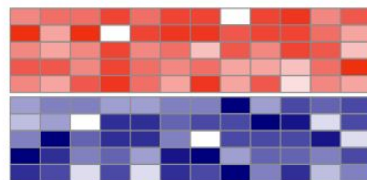
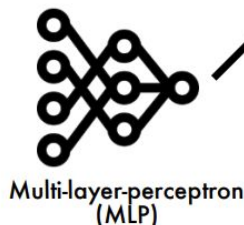
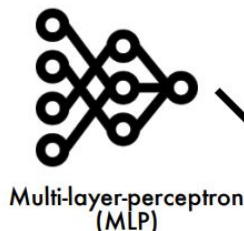
1.INPUT (Multi)-modal data matrices



■
■
■



2.ENCODING Derive sample embeddings



Use sample
embeddings for
clustering



3.PREDICTION Connect sample embeddings to one or more supervisor MLPs

Mean Squared
Error Loss (MSE) for
Numerical Variables



Cross-Entropy Loss
for Categorical
Variables



Cox Proportional
Hazards Loss for
Survival Variables

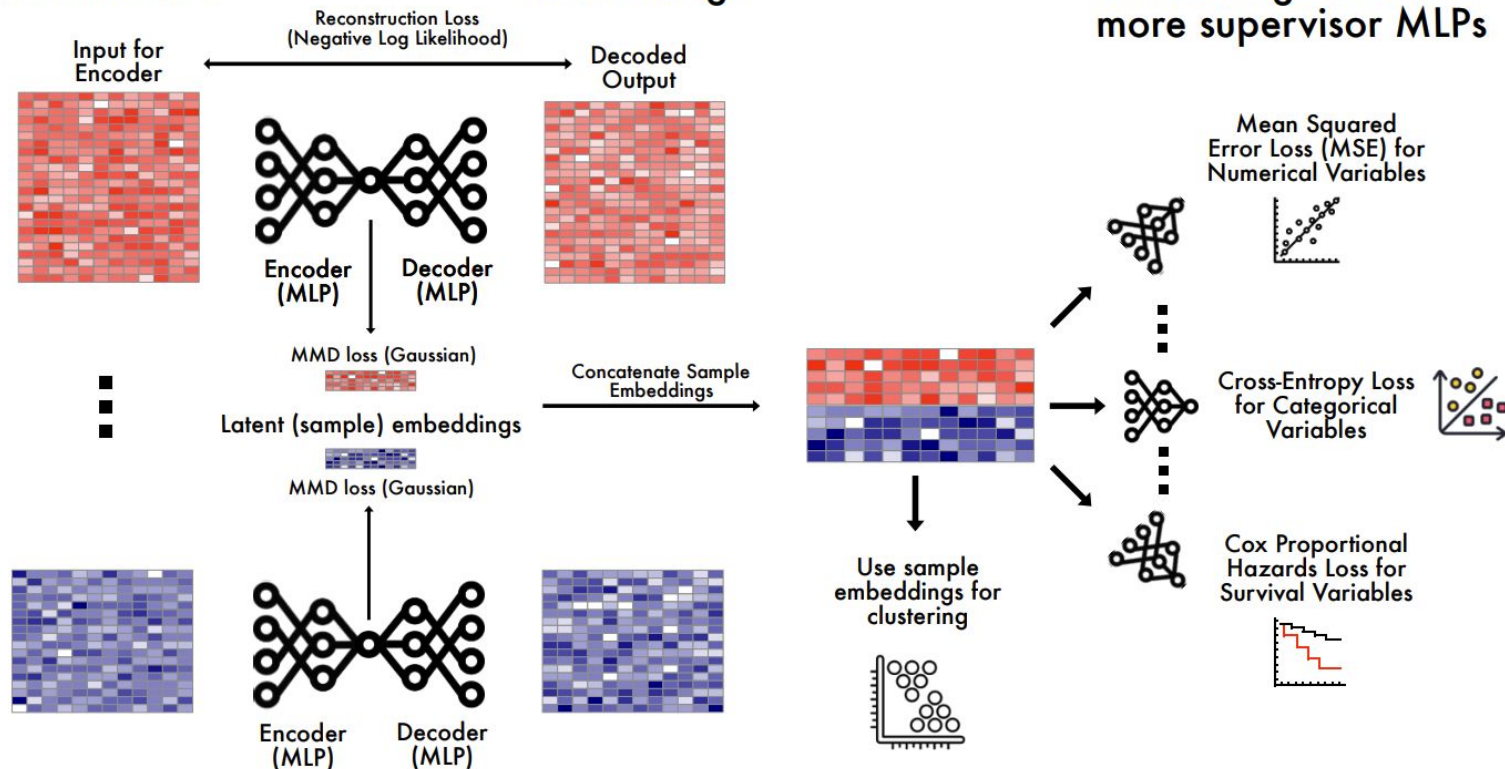


Supervised Variational Auto-Encoders

1.INPUT (Multi)-modal data matrices

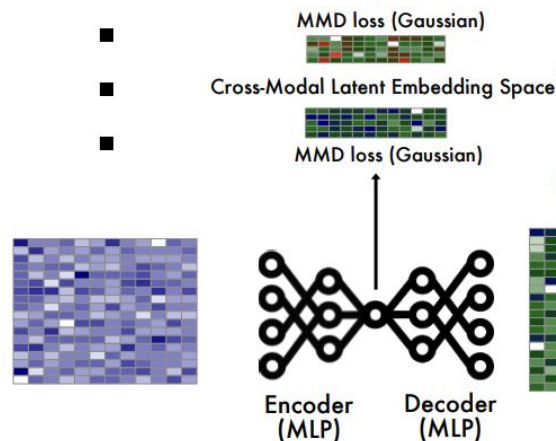
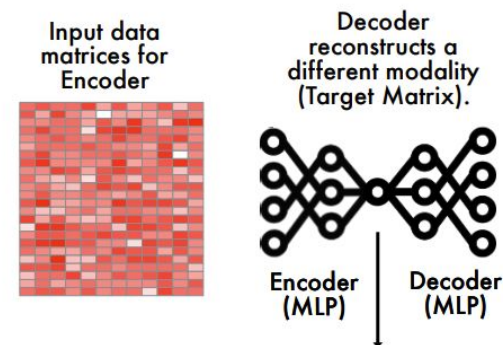
2.ENCODING Derive sample embeddings

3.PREDICTION Connect sample embeddings to one or more supervisor MLPs

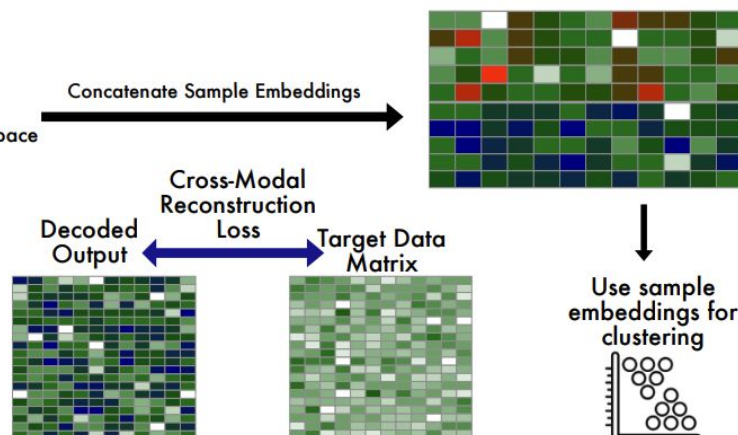
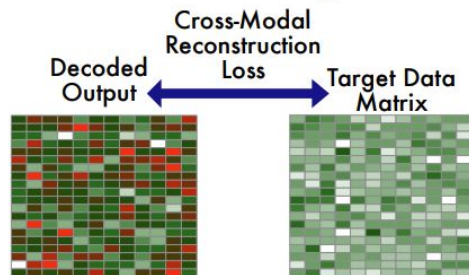


Cross-Modality Encoder Networks

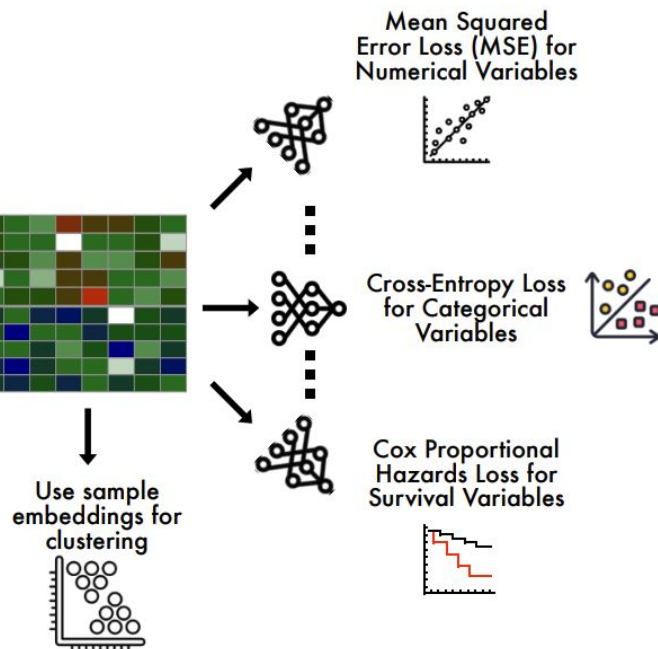
1.INPUT (Multi)-modal data matrices



2.ENCODING Derive sample embeddings



3.PREDICTION Connect sample embeddings to one or more supervisor MLPs

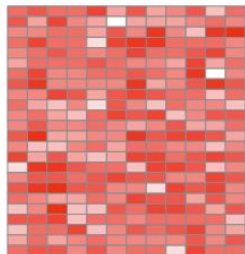


Multi-Triplet Networks

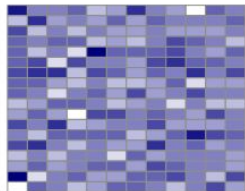
1.INPUT

(Multi)-modal data matrices

For each "anchor" sample: designate one "positive" sample (shared class label) and a "negative" sample (non-shared class label).
Goal is to **minimize** anchor-to-positive distance while **maximizing** anchor-to-negative distance.



...



2.ENCODING

Derive sample embeddings

Positive MLP



Anchor MLP



Negative MLP



Positive MLP



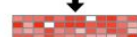
Anchor MLP



Negative MLP



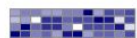
Minimize



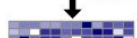
Maximize



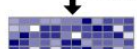
Triplet Loss



Minimize

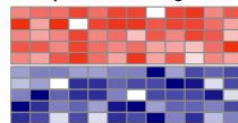


Maximize

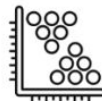


Triplet Loss

Concatenate Anchor Sample Embeddings



Use sample embeddings for clustering



3.PREDICTION

Connect sample embeddings to one or more supervisor MLPs

Mean Squared Error Loss (MSE) for Numerical Variables



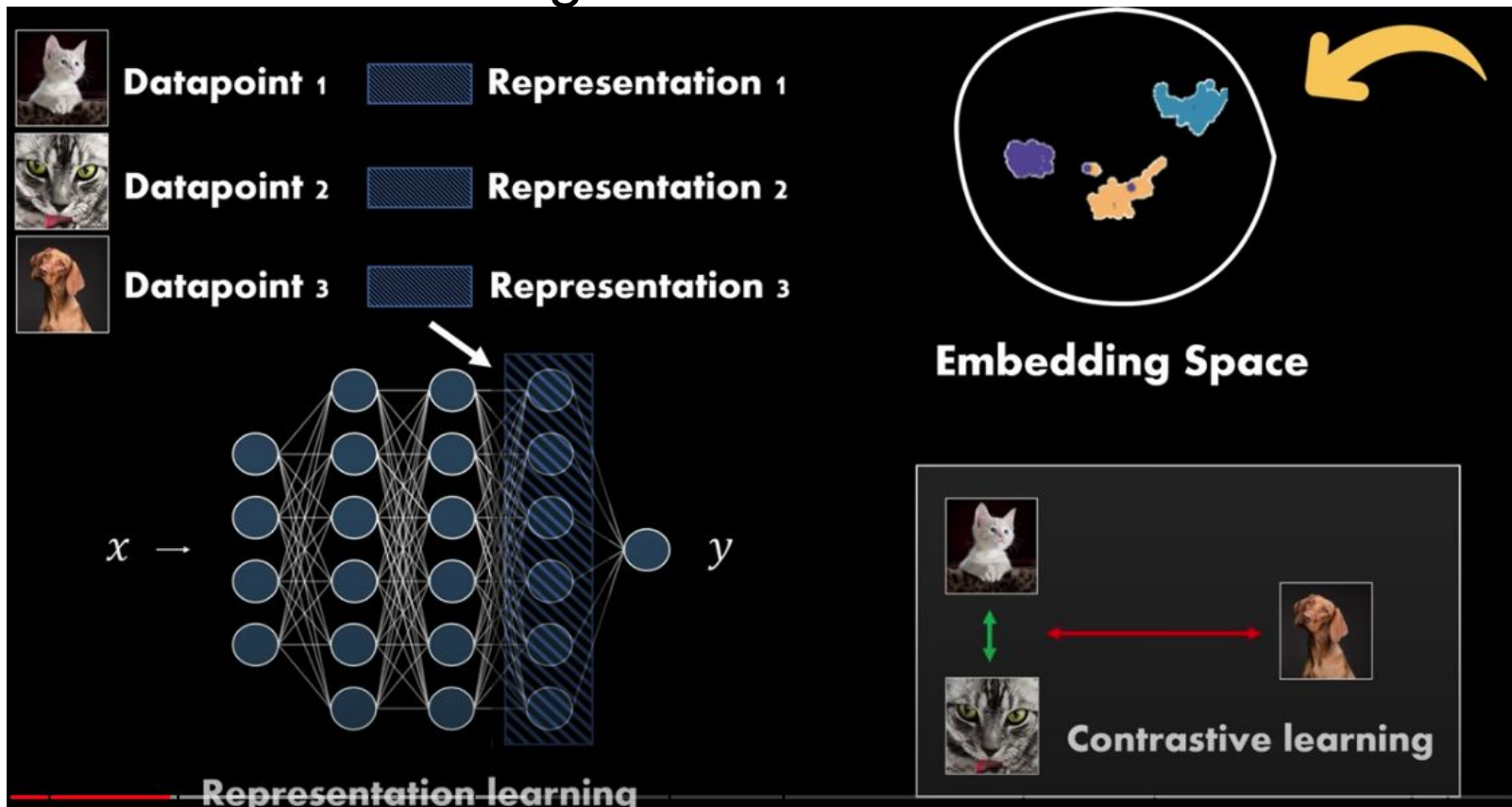
Cross-Entropy Loss for Categorical Variables



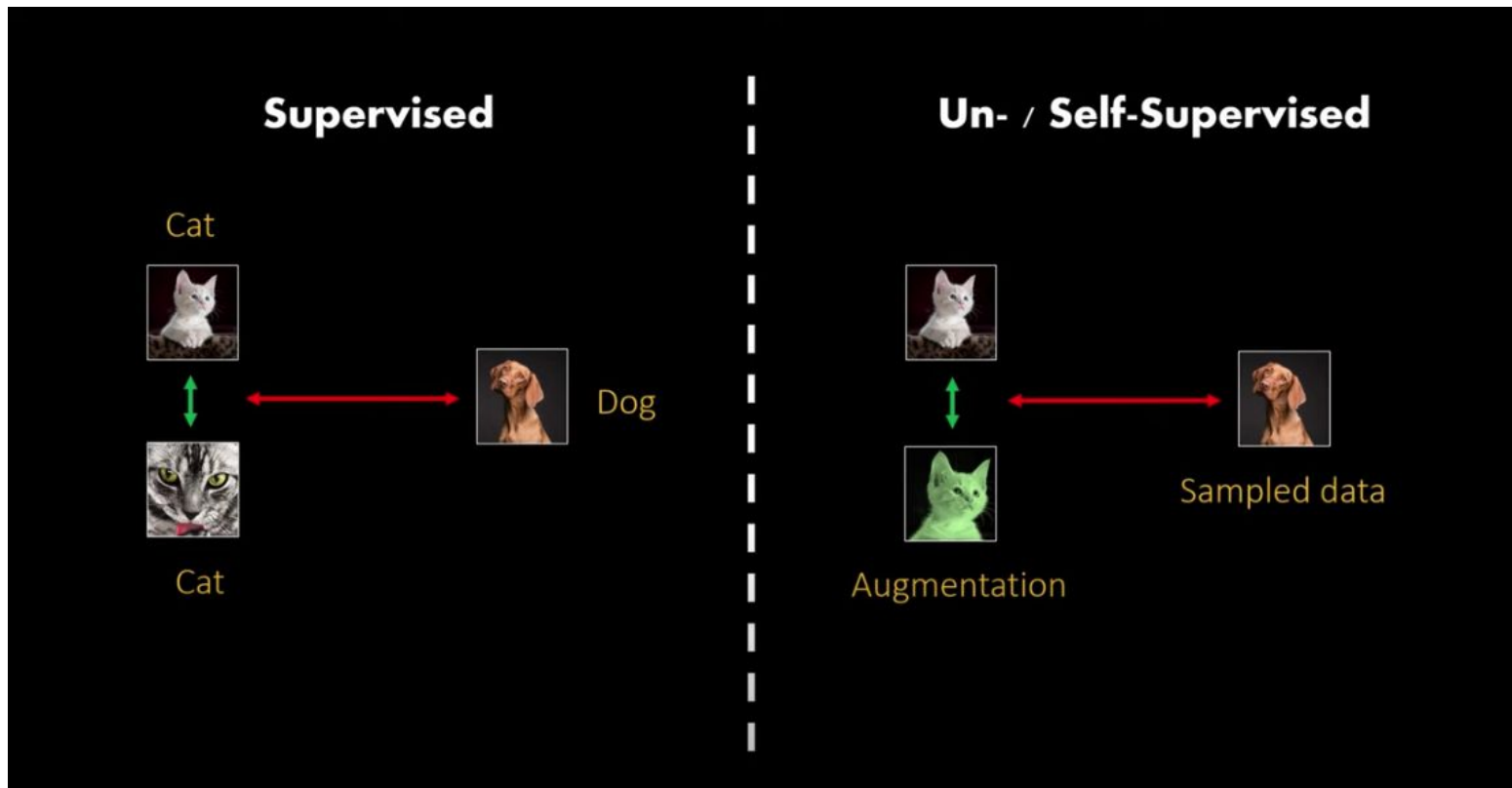
Cox Proportional Hazards Loss for Survival Variables



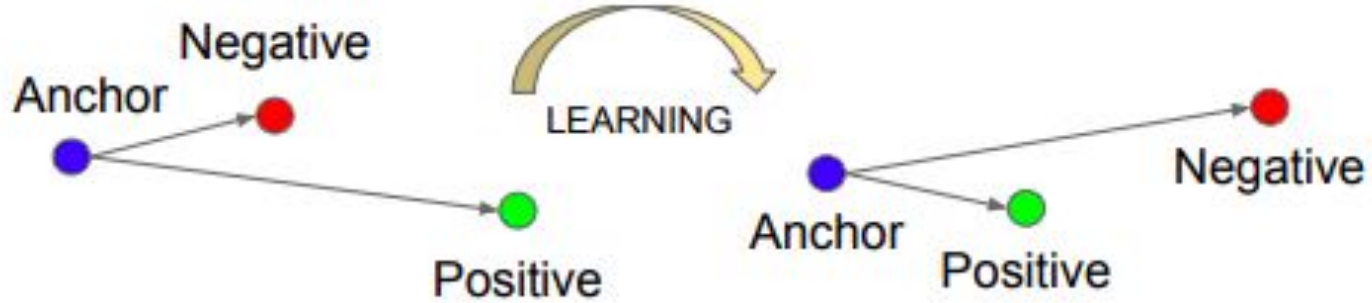
Contrastive Learning



Contrastive Learning



Triplet Loss

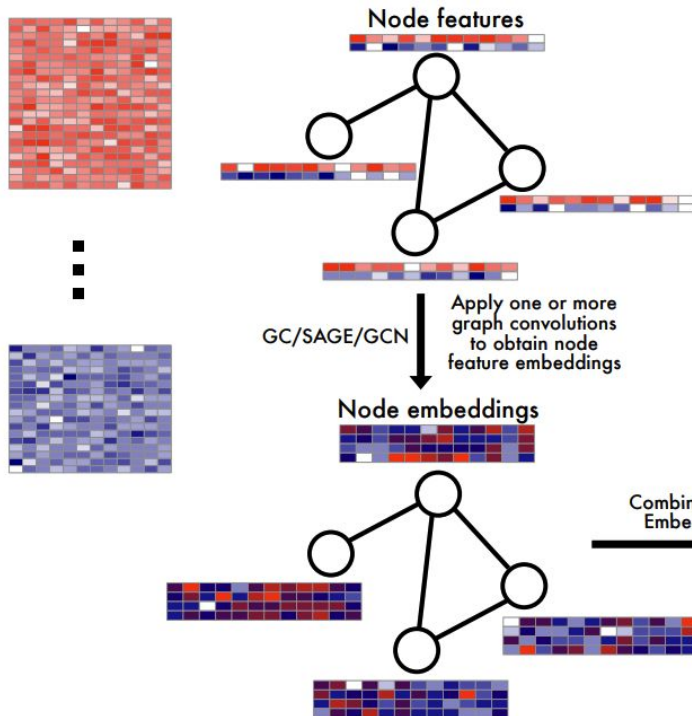


<https://github.com/adambielski/siamese-triplet>

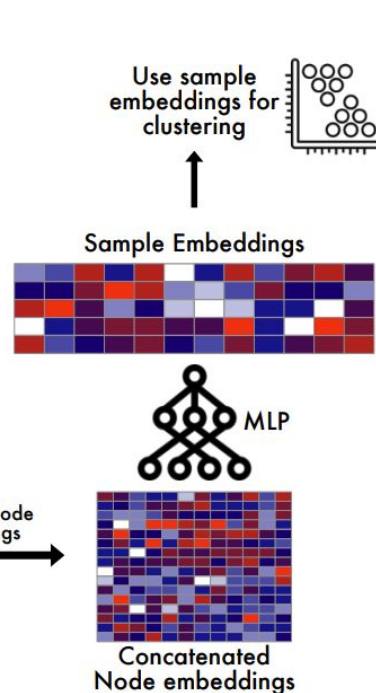
Graph-convolutional Neural Networks

1.INPUT (Multi)-modal data matrices

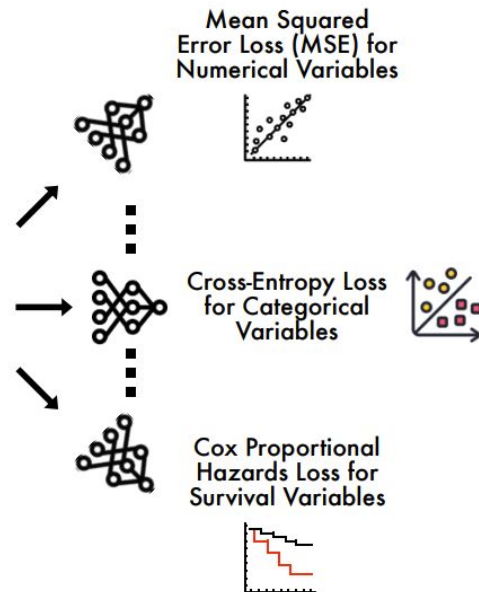
Overlay Input Omic
Measurements with Gene-
Gene Network (STRINGDB)



2.ENCODING Derive sample embeddings



3.PREDICTION Connect sample embeddings to one or more supervisor MLPs



Flexynesis Command-Line Demo

Homework

https://github.com/BIMSBbioinfo/compgen_course_2025_module3/tree/main/homeworks/hw3

