

GCN

November 6, 2020

```
[1]: using GeometricFlux;  
using Flux;  
using Flux: onecold, crossentropy, throttle, @epochs;  
using JLD2; # use v0.1.2  
using SparseArrays;  
using Statistics: mean;  
using LightGraphs: SimpleGraphs, adjacency_matrix;
```

Načtení dat - dataset Cora

```
[2]: @load "data/cora_features.jld2" features;  
@load "data/cora_labels.jld2" labels;  
@load "data/cora_graph.jld2" g;  
  
train_X = Float32.(features); # dim: num_features * num_nodes  
train_y = Float32.(labels); # dim: target_catg * num_nodes  
  
adj_mat = Matrix{Float32}(adjacency_matrix(g));
```

Nastavení parametrů modelu - Šířka skryté vrstvy - Počet výstupních tříd - Počet trénovacích epoch

```
[3]: hidden_layer_width = 16;  
num_classes = 7;  
epochs = 20;
```

Definice modelu pomocí metod balíčku GeometricFlux.jl - Jedna vrstva GCN šířky `hidden_layer_width` s aktivační funkcí ReLU - Dropout - Druhá vrstva GCN šířky `num_classes` s lineární aktivací - Softmax funkce

```
[4]: model = Chain(  
    GCNConv(adj_mat, size(train_X, 1) => hidden_layer_width, relu),  
    Dropout(0.5),  
    GCNConv(adj_mat, hidden_layer_width => num_classes),  
    softmax  
);
```

Definice ztrátové funkce - cross-entropy. Jako průběžnou míru budeme ukazovat přesnost na trénovacích datech.

```
[5]: loss(x, y) = crossentropy(model(x), y);  
accuracy(x, y) = mean(onecold(model(x)) .== onecold(y));
```

Trénujeme pomocí metody ADAM s $\eta = 0.05$.

```
[6]: train_data = [(train_X, train_y)];  
opt = ADAM(0.05);  
evalcb() = @show(accuracy(train_X, train_y));  
  
@epochs epochs Flux.train!(loss, Flux.params(model), train_data, opt,  
    ↪cb=throttle(evalcb, 10));
```

```
Info: Epoch 1  
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114  
accuracy(train_X, train_y) = 0.1532496307237814  
  
Info: Epoch 2  
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114  
accuracy(train_X, train_y) = 0.21344165435745938  
  
Info: Epoch 3  
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114  
accuracy(train_X, train_y) = 0.27141802067946824  
  
Info: Epoch 4  
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114  
accuracy(train_X, train_y) = 0.32533234859675036  
  
Info: Epoch 5  
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114  
accuracy(train_X, train_y) = 0.36152141802067944  
  
Info: Epoch 6  
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114  
accuracy(train_X, train_y) = 0.39032496307237813  
  
Info: Epoch 7  
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114  
accuracy(train_X, train_y) = 0.4169128508124077  
  
Info: Epoch 8  
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114  
accuracy(train_X, train_y) = 0.43353028064992616  
  
Info: Epoch 9  
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114  
accuracy(train_X, train_y) = 0.4519940915805022
```

```

Info: Epoch 10
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114
accuracy(train_X, train_y) = 0.46454948301329396

Info: Epoch 11
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114
accuracy(train_X, train_y) = 0.47525849335302806

Info: Epoch 12
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114
accuracy(train_X, train_y) = 0.48338257016248154

Info: Epoch 13
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114
accuracy(train_X, train_y) = 0.4885524372230428

Info: Epoch 14
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114
accuracy(train_X, train_y) = 0.49556868537666177

Info: Epoch 15
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114
accuracy(train_X, train_y) = 0.49963072378138845

Info: Epoch 16
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114
accuracy(train_X, train_y) = 0.5051698670605613

Info: Epoch 17
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114
accuracy(train_X, train_y) = 0.5107090103397341

Info: Epoch 18
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114
accuracy(train_X, train_y) = 0.5158788774002954

Info: Epoch 19
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114
accuracy(train_X, train_y) = 0.5210487444608567

Info: Epoch 20
@ Main /home/marekdedic/.julia/packages/Flux/05b38/src/optimise/train.jl:114
accuracy(train_X, train_y) = 0.5273264401772526

```

Kód je modifikací příkladů balíčku [GeometricFlux.jl](#).