Exposé
Survey on Continual Learning

Jörg Schantz (ru23cor)

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Idea

The idea of this thesis is to give a good overview of the machine learning (ML) field continual learning (CL) but through the lens of a statistician. This is to be achieved by gathering various papers on the topic and breaking down their statistical foundations. These should cover a broad spectrum of the possibilities in CL e.g. the different methodologies or criteria.

Since I enjoy coding and fiddling around with practical models more than their theory I could imagine training a linear continual learner with different regularization methods or something in the likes of for the last part of the thesis. But I am a little skeptical whether this is feasible or not. Over the last year I have also developed an interest in fraud analysis, but haven't had the time to really dive into this field. So I am thinking about taking this as an opportunity to educate myself and connect the two topics. Alternatively, Dr. Rodemann suggested to deeper analyze a single paper.

Progress of my Studies

Now about the current state of my studies. I started this degree in 2017 with a minor in Insurance and Risk Management. After the first year I changed my minor to computer science. I am still dealing with a couple of mental issues, hence the long duration, but I am determined to finish my degree.

This semester I intend to take my last two exams in GRM and I2ML. Both courses I have previously heard and solved most exercise sheets but never taken the final exam.

In my third semester I have taken the WP course "Stichprobentheorie" and in my eighth "Einführung in die Biometrie". I2ML is my last WP course that I have to pass.

The BA Seminar was together with Dr. André Klima and Dr. Georg Schollmeyer in 2020. Latter supervised my project, Visualisierung von Verteilungsunsicherheiten.

Familiarization

I have skimmed and summarized a multitude of papers. In order to keep a good overview of all my potential sources I created a mind map which connects every paper with its over arching topic. In total I would say my familiarization process is very advanced, near completion.

Submission

Preferred submission date: 01/17/2015

Potential Structure

1. Introduction

2. Setup

    2.1 Standard CL Problem

    2.2 Common Metrics

3. General Approaches

    3.1 Regularization

    3.2 Replay

    3.3 Optimization

    3.4 Representation

    3.5 Architecture

4. Dealing with Distribution Drift

5. Evaluation Metrics

6. Regularization Approach

    6.1 Quadratic Penalty Term

    6.2 Elastic Weight Consolidation

7. Bayesian Setup

8. Common Assumptions / Conclusion