COMP47650 – DEEP LEARNING

A Taste of DL

DEMO

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January 22, 2025

A Typical DL Journey

1. Data Collection and Annotation
2. Dataset Preparation
3. Modelling, Training, and Evaluation
4. Testing and Deployment

Data Collection

- Have a clear understanding of the problem and desired outcome before collecting data
- Need for diverse and representative data to avoid bias
- Develop annotation tools or use/services to label data for supervised learning tasks
- Be transparent about data used for training (new AI act requirement)
- Ensure data privacy
- Ethics: obtain informed consent from individuals before collecting their data
- Keep track of the characteristics of the data, such as number of samples, features and distribution

Dataset Preparation

- Clean data to remove errors, duplicate and missing values
- Apply pre-processing and normalization techniques
- Balance dataset by ensuring each class is represented equally or using techniques such as oversampling, under-sampling or Synthetic Minority Oversampling TEchnique (SMOTE)
- Apply data augmentation and feature extraction if appropriate
- Importance of splitting the data into training, validation, and test sets
  - Keep some training data for evaluation during training
  - Create a test set to evaluate model performance on unseen data
  - Rule of thumbs: split data 60% training, 20% evaluation, 30% Testing
- Keep in mind ethical implications such as the potential for bias in data pre-processing and dataset design

Modelling, Training, and Evaluation

- Process of choosing and designing DL model
- Apply DL techniques for training and evaluating models, such as backprop, optimizers and cross-validation
- Use best practices for monitoring model performance , addressing overfitting and under-fitting
- Evaluate model on test data:
  - Look for explainability
  - Carry out ablation studies
  - Be creative and thorough

Deploy and Test

- Deployment $\Longrightarrow$ inference mode
- Optimise model weights, re-evaluation accuracy, bias,...etc.
- Test the model in production environment
- Develop strategies for retraining model with new data to improve performance over time

Demo

- Online digit recognition
- Data collection
- Modelling, training and evaluation
- Edge deployment as gesture recognizer on mobile phone
- Going further...