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Research Projects

Survey: MMD and its applications

Nov. 2020 - Dec. 2020

- Made an in-depth introduction to MMD, including its connections to IPM and RKHS
- Covered MMD-GAN, Stein Variational Gradient Descent (SVGD), and neural style transfer as applications

Survey: The Dynamics of GANs

May. 2020 - Jun. 2020

- Covered around 10 papers
- Area covers stability of local optimum, equilibrium and Nash equilibrium of the min-max game, continuous games and gradient flow, and mean-field analysis

Learning Disentangled Representations for Polyphonic Music

Feb. 2020 - Jun. 2020

Work done as a member of the Music X Lab

- Learning disentangled representations of chord and rhythm with a VAE-based model
- Disentanglement is enforced by introducing auxiliary tasks
- Learned chord and rhythm representations can be swapped directly for controlled generation

Investigating how Deep Image Prior Interacts with VAE

May. 2020 - Jun. 2020

- Investigated whether early stopping or SGLD can also improve the sharpness of VAE outputs
- Result is negative
- Also found out potential mistakes in the original DIP paper: SGLD also used Adam, but original SGLD does not work

A Generalized Framework of Bayesian GAN for Adversarial Autoencoders

Oct. 2019 - Dec. 2019

- Recast the alternating update of the generator and discriminator as Gibbs sampling
- Used that to extended Bayesian GAN to multiple component cases (e.g. adversarial autoencoders)
- The resulting theoretical framework also applies to follow-up works like ProbGAN

Relighting Landscape Photos via Neural Style Transfer

Oct. 2019 - Dec. 2019

- Change a landscape photo to how it should look like at a different time of the day
- Collected 240k labeled data from the GTA game by coding a mod
- Trained with U-Net with perception loss
- Will be refined as a Master's capstone project

Undergraduate Research Projects

Neural Code Generation *Oct. 2018 - May. 2019*

Supervisor: Anoop Sarkar

- Generating code from natural languages describing its behavior
- Two-Phase Coarse-to-Fine Strategy with a tree-structured decoder
- Beat the state of art on the Django dataset

STOKE for HRM *Apr. 2018 - Aug. 2018*

Supervisor: Nick Sumner

- Superoptimization for the Human Resource Machine architecture via Markov Chain Monte Carlo (MCMC) sampling
- Use average edit distance on output stream as program equivalence approximator to reward partial success
- Efficiently implemented in Rust

Test Case Reduction *Jun. 2018 - Aug. 2018*

Supervisor: Nick Sumner

- Test Case Reduction by leveraging fact that sometimes the grammar of the tests is known
- Implemented as a skippy Earley Parser, adding a 'SKIP' action to forward Earley items, then extract test cases from the compact representation of the parse forest
- Allow for parallel testing because the method is not adaptive

SuperHuman *Nov. 2017 - Jan. 2018*

Supervisor: Nick Sumner

- Search-based synthesizer and superoptimizer for the Human Resource Machine architecture
- Used handcrafted heuristics and symbolic I/O examples for aggressive pruning over the vast program space
- Able to find the shortest program(13 instructions) in 5 seconds within a single basic block
- Also tried syntax-guided synthesis (SyGuS) and prototyped with Rosette

Selected Projects

Neural Turing Machine *May 2018*

`https://github.com/endvroy/ntm`

- Implemented the Neural Turing Machine with Pytorch
- Tested the implementation with the COPY task and the REPEATED COPY task

Efficient Path Profiler *Nov. 2017*

`https://github.com/endvroy/efficient-path-profiler`

- An LLVM-based, dynamic path profiler
- Records which execution path in each function is actually executed
- Uses an efficient encoding of execution paths as described in *Efficient Path Profiling*

Buffer Overflow Detector *Oct. 2017*

`https://github.com/endvroy/buffer-overflow-detector`

- Detecting potential buffer overflow with dataflow analysis
- static analysis with the dataflow framework on the range of array indices
- Implemented with LLVM

Call Graph Profiler *Sep. 2017*

`https://github.com/endvroy/callgraph-profiler`

- An LLVM-based, dynamic call graph profiler
- Modifies a given program to count the number of times each call site is actually invoked while maintaining its original functionality
- When calling through function pointer, the actual called function is inferred from the address stored in the pointer

Linguist *Jul. 2017*

`https://github.com/endvroy/linguist`

- An LALR(1) compiler-compiler that is built upon itself
- Implemented a custom DFA-based regular expression engine that efficiently handles negative character sets
- User-specified actions can be associated with each lexical or grammatical rule

WebTetris *Dec. 2017*

`https://github.com/endvroy/webtetris`

- An online Tetris match system that runs in a browser
- Two players can join a match in the lobby, competing with real-time updates of the other player's status
- Implemented with Flask and websocket, designed to be anti-cheating

miniSQL *May 2016*

`https://github.com/endvroy/minisql`

- Led a team of 3 and built our own database engine
- Supports lazy deletion, B+ tree indexing and block cache management with the Least Recent Used (LRU) policy
- Adopted a Test-Driven Development (TDD) approach

my-shell *Oct. 2016*

`https://github.com/endvroy/my_shell`

- Built a simple shell in C
- Supports pipelining, background execution and job control

Library Management System *April 2016*

`https://github.com/endvroy/library`

- Built an example library management system with GUI using Python
- Adopted a Model-View-Controller (MVC) design, use SQLAlchemy to connect to MySQL, and built GUI with Kivy
- Provide a different interface for students and administers, allow administers to borrow and return books, search the history and manage library cards

Awards

2018	**VP Research - Undergraduate Student Research Award - Science**, Simon Fraser University	*Vancouver, Canada*
2018	**Undergraduate Open Scholarship**, Simon Fraser University	*Vancouver, Canada*
2017	**Undergraduate Open Scholarship**, Simon Fraser University	*Vancouver, Canada*
2016	**5th Place**, Microsoft Coding Competition	*Vancouver, Canada*
2016	**SFU-Zhejiang University DDP Entrance Award**, Simon Fraser University	*Vancouver, Canada*

Education

New York University *Sep. 2019 - Jun. 2020*
M.Sc. in Computer Science *New York City, USA*

Simon Fraser University *Sep. 2016 - April 2019*
B.Sc. in Computer Science (graduated with distinction) *Vancouver, Canada*

Zhejiang University *Sep. 2014 - Jun. 2016*
B.Sc. in Computer Science *Hangzhou, China*