Yan Zhang

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Research Interests

○ Learning to reason and abstract.

○ Representation of sets and graphs in deep neural networks.

○ Generative models for structured data.

Publications

under review   Qian Huang, Horace He, Abhay Singh, Yan Zhang, Ser-Nam Lim, Austin Benson. Set-Structured Latent Representations. Submitted to *International Conference on Machine Learning*, 2020.

ICLR 2020   Yan Zhang, Jonathon Hare, Adam Prügel-Bennett. FSPool: Learning set representations with featurewise sort pooling. In *International Conference on Learning Representations*, 2020.

NeurIPS 2019   Yan Zhang, Jonathon Hare, Adam Prügel-Bennett. Deep Set Prediction Networks. In *Advances in Neural Information Processing Systems 32*, 2019.

ICLR 2019   Yan Zhang, Jonathon Hare, Adam Prügel-Bennett. Learning representations of sets through optimised permutations. In *International Conference on Learning Representations*, 2019.

ICLR 2018   Yan Zhang, Jonathon Hare, Adam Prügel-Bennett. Learning to count objects in natural images for visual question answering. In *International Conference on Learning Representations*, 2018.

Education

PhD Machine Learning   Southampton, United Kingdom
University of Southampton   *2016–2020*
Thesis: *Learning to Represent and Predict Sets with Deep Neural Networks.*
Supervisor: Adam Prügel-Bennett.

○ **Four first-author papers** published in **top machine learning conferences**.

○ **76 citations** on Google Scholar show the **impact** my work has already had.

○ Thesis summary: Deep Learning with sets as input or output. Sets are useful for modeling structured data like agents in an environment and objects in images. I pioneered work on sets by identifying several issues with existing approaches and developed new models that avoid these problems.

BSc Computer Science: First Class Honours   Southampton, United Kingdom
University of Southampton   *2013–2016*
Thesis: *Biologically-inspired Entropy Feedback Neurons in Deep Learning Architectures.*
Supervisor: Klaus-Peter Zauner.

○ **Top of the year** in Computer Science **for all three years**.
  Average grade: **89.75**/100 (>70 equivalent to GPA 4.0). Thesis grade: 91.

Research Experience

- Strongly **self-managed, interest-driven research**. Path from research agenda to initial idea to completed papers with very little guidance from supervisors necessary.

- Experienced with writing successful papers, especially **communicating ideas clearly**. Three out of four of my first-author papers accepted on first submission.

- Reviewer for seven papers at AAAI-2020, including one emergency review. Evaluated and discussed submissions in-depth and within the deadlines. My reviews matched all 7 final decisions, showing my excellent judgement of quality.

- Research assistant internship on "Analysing Programs with Graphs" in automata theory with Gennaro Parlato, University of Southampton, in 2015.

Invited talks

PyData Cambridge (scheduled)
Deep Learning with Sets (45 minute talk)
Cambridge, United Kingdom
scheduled July 2020

London Machine Learning Meetup
Deep Learning with Sets (45 minute talk)
London, United Kingdom
February 2020

FiveAI
Deep Learning with Sets (45 minute talk)
Cambridge, United Kingdom
July 2019

Awards and Funding

Postgraduate awards	Undergraduate awards
PhD studentship, 60,000 GBP + tuition fees.	Zepler Project Prize (Bachelor thesis grade above 90), 50 GBP.
NeurIPS 2019 travel award, hotel during conference worth ~1,800 USD.	ICL Prize (top grades of year 3), 50 GBP.
ICLR 2019 travel award, 1,000 USD.	BAE Systems Applied Intelligence Prize (top grades of year 2).
ICLR 2018 travel award, 1,000 USD.	Netcraft Prize (top 10 grades of year 2), 250 GBP.
	Winton Capital Management Prize (top grades of year 1), 250 GBP.

Competitions

Recommender system challenge
1st *out of ~10 teams*   *2015*
Won using collaborative filtering approach with pipeline in Python.

IEEEXtreme 8.0
50th *out of ~2000 teams internationally*   *2014*
24 hour programming competition in teams of 3 with very little practice.

Robocode tournament
1st *out of ~10 teams*   *2013*
Classical AI in Java. Winner of both 1-vs-1 and battle royale tournaments as a group of 3.

IEEEXtreme 7.0
79th *out of ~2000 teams internationally*   *2013*
24 hour programming competition in teams of 3 with very little practice.

Open source projects

Leela Chess Zero (★900+)

Contributor   *2018–Current*

Neural network chess engine that reproduces and improves on AlphaZero.

- Collaboratively discussed ideas and evaluated them in **PyTorch** and **TensorFlow** to improve neural network performance. Implemented PyTorch training script from scratch.
- Implemented high-performance C++ data loader, Q-learning, policy masking, gradient accumulation, featurewise linear modulation (Perez et al., 2017), transformers (Vaswani et al., 2017), linear context transforms (Dongsheng et al., 2020), manifold mixup (Verma et al., 2019), weight histograms, weight update ratios, and more.

Deep Set Prediction Networks (★50+, 6 citations)

Author   *2019*

- Implemented *Deep Set Prediction Networks* (Zhang et al., 2019).
- Implemented *Deep Perm-Set Net: Learn to predict sets with unknown permutation and cardinality using deep neural networks* (Rezatofighi et al., 2018).

Featurewise Sort Pooling (★8)

Author   *2019*

- Implemented *FSPool: Learning set representations with featurewise sort pooling* (Zhang et al., 2020).
- Implemented *Janossy Pooling: Learning Deep Permutation-Invariant Functions for Variable-Size Inputs* (Murphy et al., 2019).
- Implemented *A simple neural network module for relational reasoning* (Santoro et al., 2017).
- Implemented *Learning Representations and Generative Models for 3D Point Clouds* (Achlioptas et al., 2018).

Permutation-Optimisation (★30+, 5 citations)

Author   *2018*

- Implemented *Learning representations of sets through optimised permutations* (Zhang et al., 2018).
- Implemented *Learning Latent Permutations with Gumbel-Sinkhorn Networks* (Mena et al., 2018).

Counting in Visual Question Answering (★150+, 60+ citations)

Author   *2017*

- Implemented *Learning to count objects in natural images for visual question answering* (Zhang et al., 2018).
- Used by *Bilinear Attention Networks* (Kim et al., 2018) to obtain **single-model state-of-the-art** in VQA Challenge 2018.

Strong Baseline for Visual Question Answering (★110+)

Author   *2017*

- Implemented *Show, Ask, Attend, and Answer: A Strong Baseline For Visual Question Answering* (Kazemi et al., 2018).

★ denotes number of stars on GitHub.