



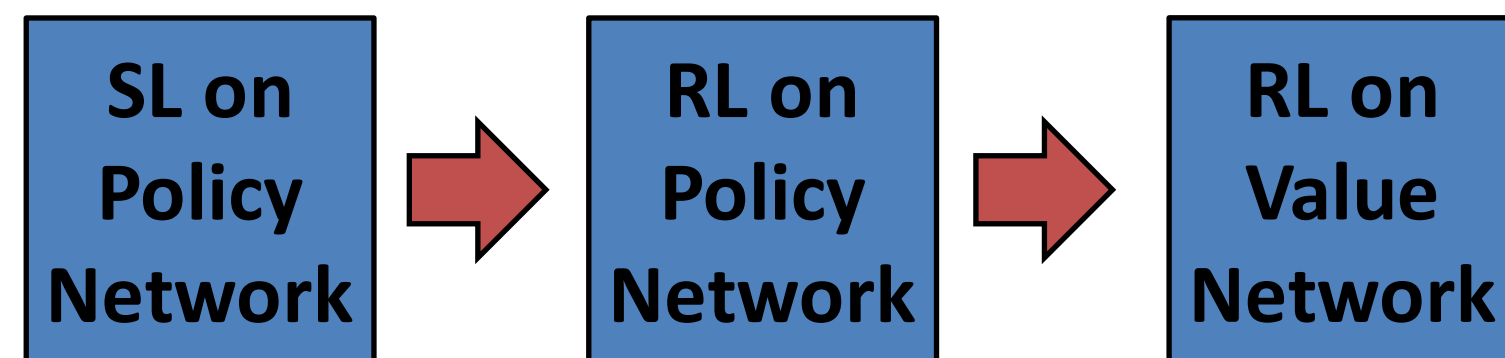
GoGoGo: Improving Deep Neural Network Based Go Playing AI with Residual Networks

Xingyu Liu

Introduction

- Go playing AIs using Traditional Search: GNU Go, Pachi, Fuego, Zen etc.
- Powered by Deep Learning: Zen → Deep Zen Go, darkforest, AlphaGo
- Goal: From by Vanilla CNN to ResNets

Training Methodology and Data



- Use Ing Chang-ki rule
Board State + Ko is Game State, No need to remember the number of captured stones
- From Kifu to Input Feature Maps
Channels: 1) Space Positions; 2) Black Positions; 3) White Positions; 4) Current Player; 5) Ko Positions

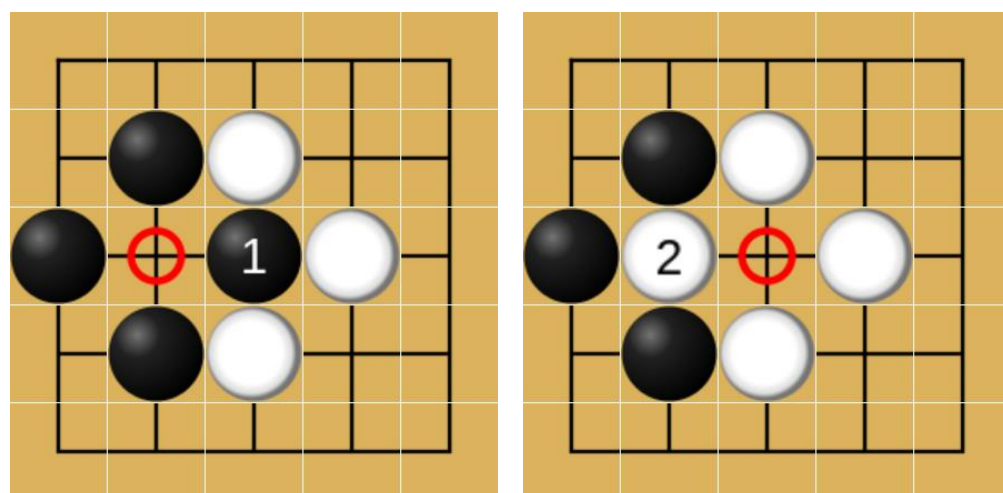
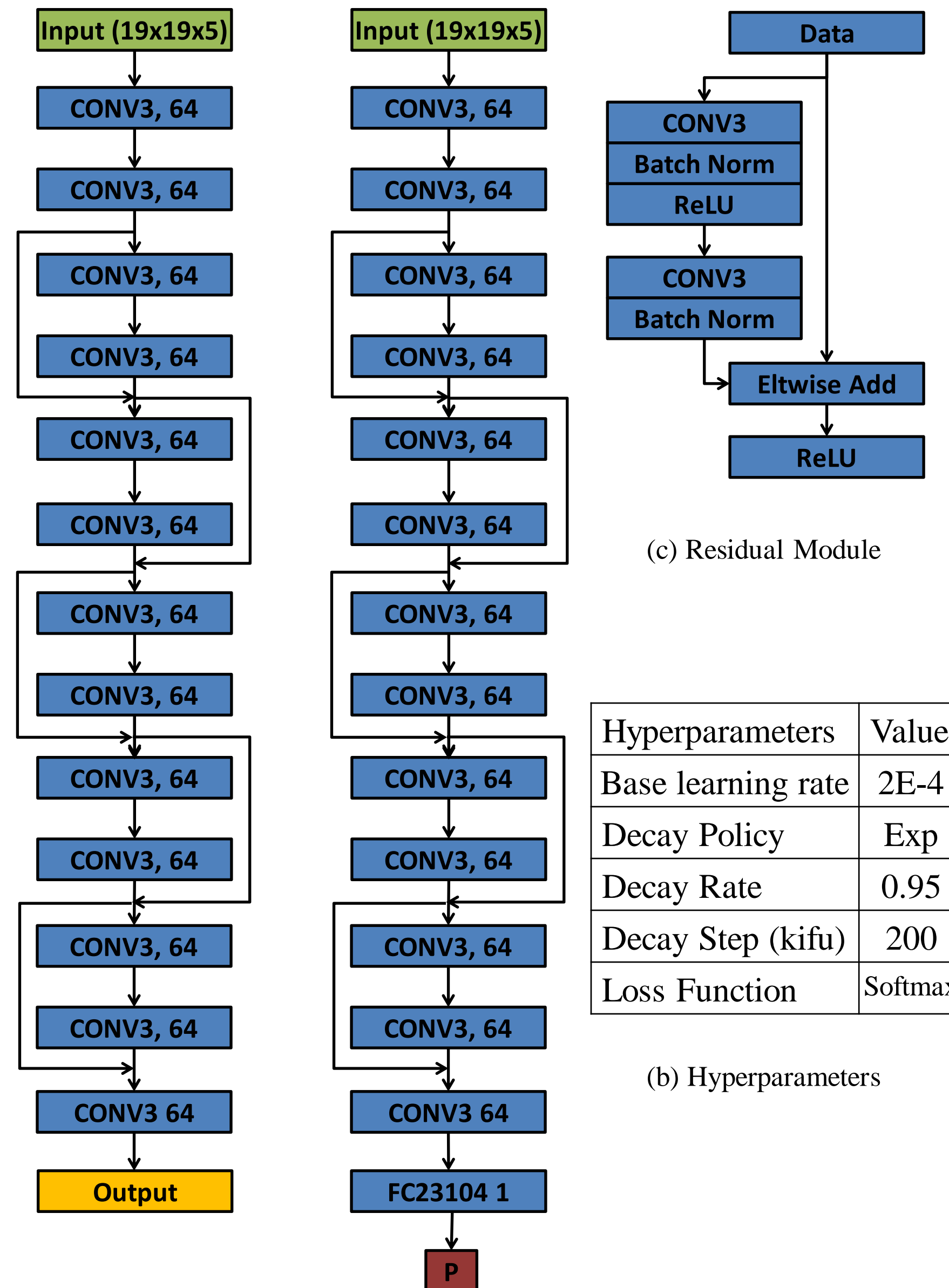


Fig. 1. Ko fight explicit expansion

- Dynamic Board State Expansion
Ko fight performing. Saves disk space. Small Mem
- Two Levels of Batches (Kifus, moves)
Random Shuffling. Mem usage small and locality.

Network Architecture



Hyperparameters	Value
Base learning rate	2E-4
Decay Policy	Exp
Decay Rate	0.95
Decay Step (kifu)	200
Loss Function	Softmax

(b) Hyperparameters

Fig. 2 (a) Policy Network (b) Value Network

- Monte Carlo Tree Search
- $$a_t = \operatorname{argmax}_a (Q(s_t, a) + u(s_t, a))$$
- $$u(s, a) \propto \frac{P(s, a)}{1 + N(s, a)}$$

Experiment Result

- Training Accuracy ~ 32%
- Testing Accuracy ~ 26%

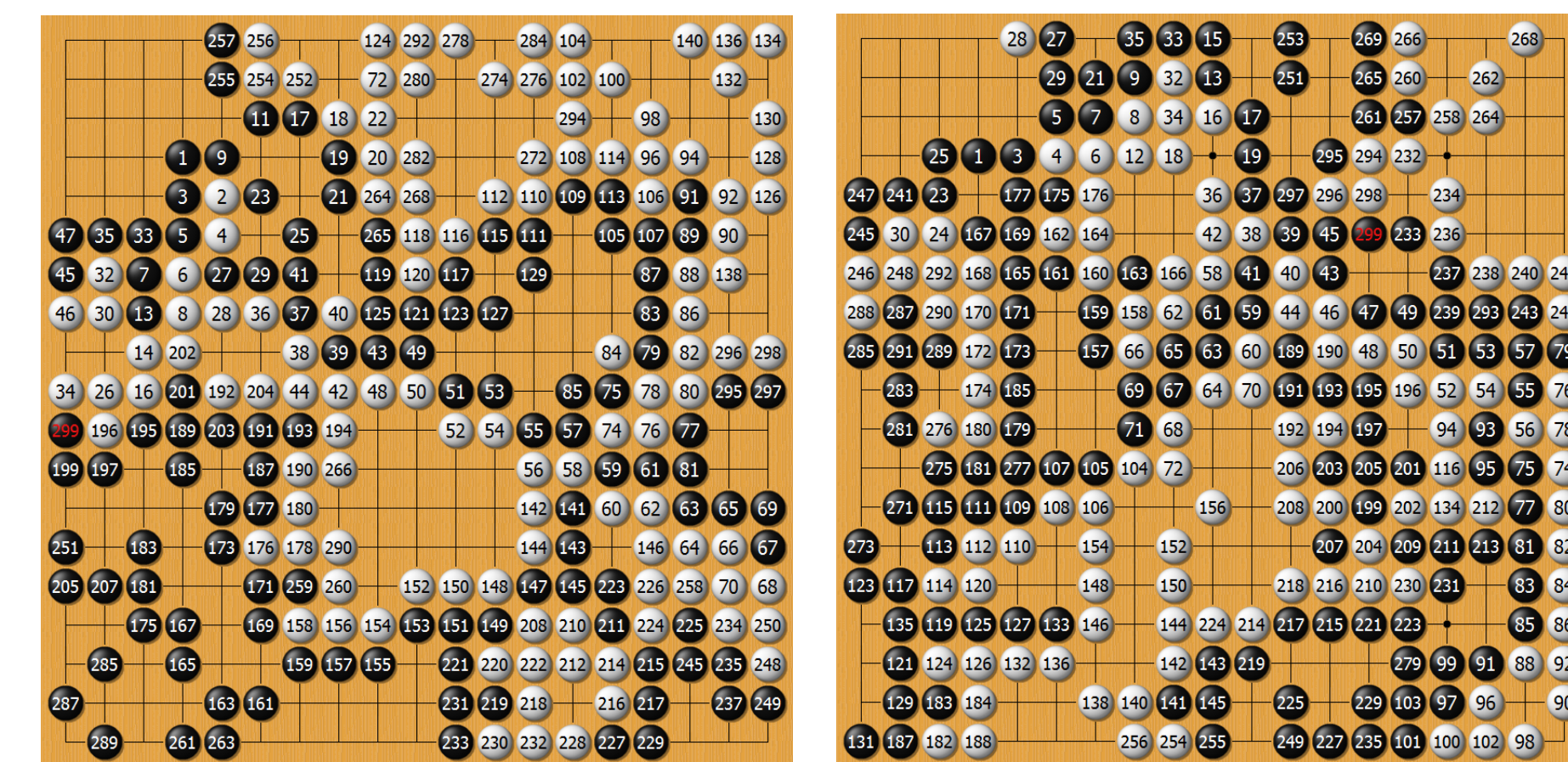
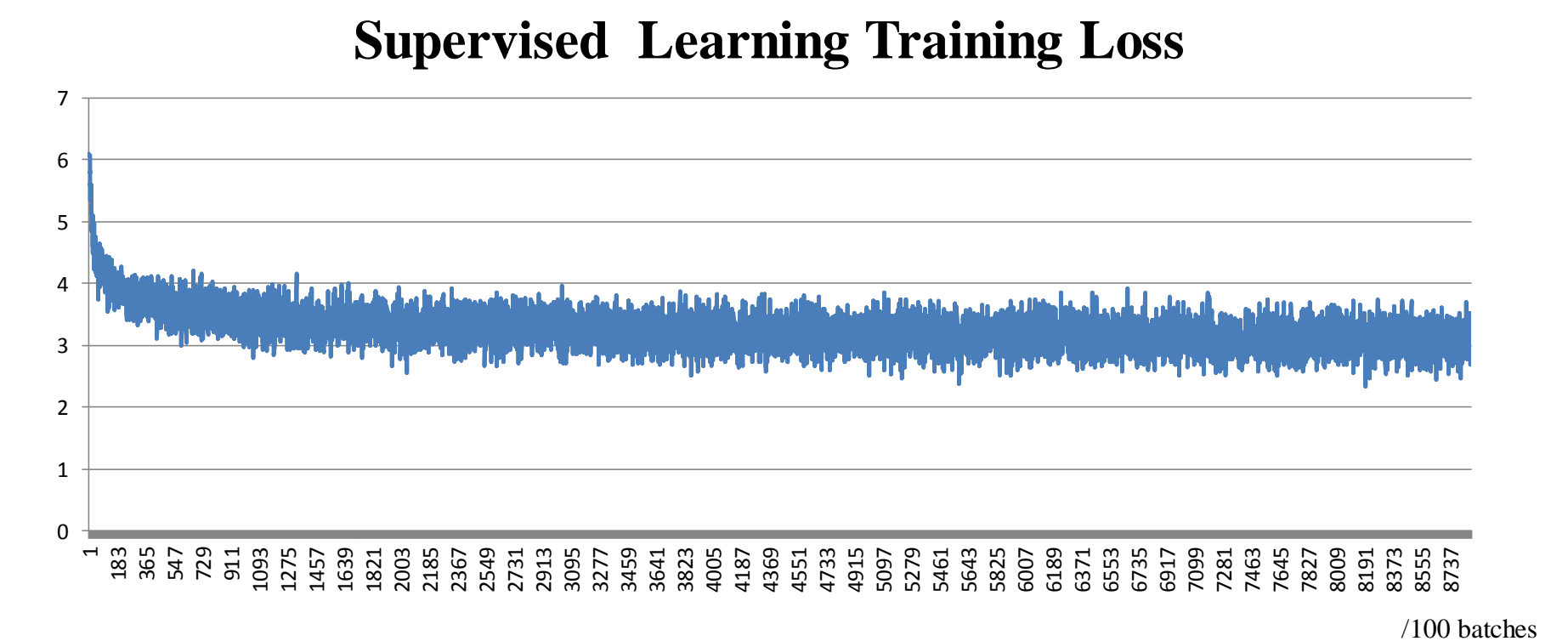


Fig. 3 GoGoGo plays against itself, policy network only

Future Work

- Reinforcement Learning of Value Network
- Network Architecture Exploration
- Real Match Testing against Human Players

[1] David Silver et al., "Mastering the game of go with deep neural networks and tree search", Nature, 529:484–503, 2016.
 [2] Kaiming He et al., "Deep residual learning for image recognition", CoRR, abs/1512.03385, 2015.