

IMPERIAL COLLEGE LONDON

DEPARTMENT OF COMPUTING

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# Data Efficient Deep Reinforcement Learning using Inductive Logic Programming

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## **Abstract**

Your abstract.

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## Acknowledgments

Comment this out if not needed.



# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Background</b>	<b>2</b>
<b>3</b>	<b>Motivation</b>	<b>3</b>
3.1	Objectives . . . . .	3
3.2	Project outline . . . . .	3
3.3	Contribution . . . . .	3
<b>4</b>	<b>Background</b>	<b>4</b>
4.1	Reinforcement Learning . . . . .	4
4.2	Symbolic reinforcement Learning . . . . .	4
4.3	GVGAI framework . . . . .	4
4.4	Legal and Ethical Issues . . . . .	4
<b>5</b>	<b>Contribution</b>	<b>5</b>



# Chapter 1

## Introduction

Problem setting

Two most studied approach for using previous learning exprience is meta-learning and transfer learning

Artificial General Intelligence

Definision of AGI



# Chapter 2

## Background

The history of data-efficient learning What other people have done in this.  
The advance of statistical machine learning methods, especially deep reinforcement learning  
AlphaGo, and AlphaGo Zero  
Also business success.  
History of Relational Reinforcement Learning  
Bayesian Optimisation  
RNN approach  
Symbolic Deep reinforcement learning  
Some implementation: German paper

# Chapter 3

## Motivation

Why symbolic reinforcement learning is good attempt

Reason 1:

Reason 2:

Comprehensible by humans -> Explainable rather than black-box

Use of previous experience (background knowledge)

Not much explored yet.

TODO Explain how reinforcement learning works

Recent advance of ILASP is promising

Because of the recent advancement of logic-based learning and deep reinforcement learning, combination of both approach would be a next exploration toward artificial general intelligence.

### 3.1 Objectives

### 3.2 Project outline

which measurement would you use? (grid world, something else? GVGAL games)

Summarise different types of knowledge representations (Objects ?? relationship?)

Common sense

Implement based on Towards Deep Symbolic Reinforcement Learning

### 3.3 Contribution

# Chapter 4

## Background

ASP

What is ILP?

ILASP

ILASP task containing a context-dependent example

TODO Explain how symbolic learning works

TODO What would you learn in my context? Relationship of the objects? Objects, types, locations and interactions.

### 4.1 Reinforcement Learning

### 4.2 Symbolic reinforcement Learning

Explain the paper

### 4.3 GVGA framework

### 4.4 Legal and Ethical Issues

???

# **Chapter 5**

## **Contribution**