Course: 282.772 Industrial System Design and Integration.

Assessment: Assessment 04 – Written Assignment.

Course Learning Outcomes Assessed:

- Apply the principles and technologies in industrial systems design and integration.
- Apply the principles and technologies in intelligent machines design and integration.
- Design mechanical motion systems, simulate dynamics, and animate mechanisms.
- Use a knowledge system development software.
- Represent industrial knowledge and understand inference principles.
- Develop a simple knowledge-based system.
- Demonstrate familiarity with industrial vision systems and vision-based automatic systems.

Weighting: 40%.

Due Date: 11/10/2019.

This is an individual assessment.

Introduction

Companies such as Amazon use robots in their order fulfilment processes, e.g. they are being used to pack an order's items into a box. One challenge in packing objects is recognising what is being packed and grasping it accordingly. To address this challenge, Artificial Intelligence (AI) can be used to classify an object and a subsequent grasping strategy proposed. In this assessment, you are required to train an AI system to classify two types of objects: a spanner and a screwdriver.

Aims

The assessment's aims are to:

- Introduce you to Keras and TensorFlow.
- Train a neural network that can be used within a mechatronic system.

Objectives

The assessment's objectives are to:

- Prepare a dataset of spanner and screwdriver images.
- Define your own neural network's architecture.
- Train your neural network.
- Evaluate your trained neural network's performance.

Requirements

You are required to:

- Complete the assessment's objectives.
- Write a report detailing what you did, how, and why.

Submission Instructions

Add all your work to a .zip archive and name it in the following format: FIRSTNAME_LASTNAME_ID.zip. Be sure to include your neural network's source code and trained model.

Do not include your data set.

Upload your submission to Stream before the due date. A 5 % per day penalty will be applied to late submissions.

Frequently Asked Questions

- Where should I get spanner and screwdriver images from?

Start with ImageNet (http://www.image-net.org/index). Searching for “spanner” and “screwdriver” will give you approximately 1000 and 1400 images, respectively. You can use the corresponding images’ URLs to download them to your computer.

- Do I have to use TensorFlow?

No, you can use an alternative framework; however, I can’t offer much help for non-TensorFlow and non-Keras frameworks and APIs.

- Do I need to train my neural network on a CPU?

No, if you have a Nvidia, CUDA-enabled graphics card, you can train your neural network using your GPU instead. You’ll need to configure your installation accordingly, e.g. use the tensorflow-gpu package instead of the default tensorflow package and make sure CUDA is set-up on your computer properly.

Marking Rubric

	E Range (0 – 39.99)	D Range (40 – 49.99)	C Range (50 – 64.99)	B Range (65 – 79.99)	A Range (80 – 100)	Weighting
	Inadequate	*Poor*	*Adequate*	*Good*	*Excellent.*	
Report	The report describes what was done. The trained network's architecture is presented. The report's grammar, punctuation, fluency, spelling, and language is inadequate.	The report describes what was done. The trained network is presented. The trained network's performance is presented. The report's grammar, punctuation, fluency, spelling, and language is poor.	The report describes what was done. The trained network is summarised. The trained network's performance is summarised. The report's grammar, punctuation, fluency, spelling, and language is adequate.	The report describes what was done and how. Some neural network architectures and layer types have been described. The trained network is described. The trained network's performance is analysed. The report's grammar, punctuation, fluency, spelling, and language is good.	The report describes what was done, how and why. Several neural network architectures and layer types have been investigated and their performance discussed. The trained network is described and discussed in detail. The trained network's performance is analysed and critiqued in detail. The report's grammar, punctuation, fluency, spelling, and language is excellent.	100%