



SCHOOL OF COMPUTER AND  
COMMUNICATION SCIENCES

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

**Computer Vision Laboratory**  
**Unseen Spacecraft Pose Estimation**

Baseline solution by implementing a machine learning  
framework with target models included

Bachelor's Thesis in Computer Science

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I hereby confirm that I am the sole author of the written work here enclosed and that I have compiled it in my own words. Parts excepted are corrections of form and content by the advisors.

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## Abstract

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# **1 Introduction**

## **1.1 Problem statement**

### **1.1.1 The settings**

### **1.1.2 The goal**

## **1.2 The work environment: Scitas Izar**

## **2 Scientific papers review**

### **2.1 Some ML models**

### **2.2 Gen6D: Pros and cons**

## **3 Gen6D: formal description**

### **3.1 Overview of the network**

### **3.2 Detection**

### **3.3 Viewpoint selection**

### **3.4 Pose refinement**

### **3.5 Results on LINEMOD**



## **4 Implementation of the model**

### **4.1 Data loader**

### **4.2 Issues and proposed solutions**

#### **4.2.1 Issues No. 1**

#### **4.2.2 Issues No. 2**

## **5 Experimental results and analysis**

### **5.1 Spacecraft dataset characteristics**

### **5.2 Vizualisation of results**

### **5.3 Evaluation metrics**

### **5.4 Quantitative evaluation**

## **6 Ways of improvements**

### **6.1 Specialized spacecraft training set**

### **6.2 Improved object detection algorithms**

Rely more on the 3D model (for now only the size), would optimize for symmetric and irregular shaped spacecrafts

### **6.3 Robustness to occlusion**

## 7 Conclusion

Limitations Acknowledgments My personal contribution

# Abbreviations

## Appendix