

Aldebaran AI Lab
Internships positions
Starting as soon as possible



ailab-internship@aldebaran.com

The AI Lab:

The Artificial Intelligence group (AI-Lab) is a research unit inside Aldebaran Robotics which focuses on developmental robotics. Our goal is to make progress in the understanding and modeling of the mechanisms of development and learning in robots.

In this context, multiple topics are proposed for mid- to long-term internships, both in fundamental research and applied research. We aim to offer a stimulating environment, working on high-tech humanoid robotic platforms. The following internship proposals are broad so that they can be discussed and oriented depending on the profile of the candidate.

Applied Research

A1 - Ensemble learning for face detection

Multiple algorithms for face detection are now available in the research community and as commercial products. The goal of this internship is first to review the state-of-the-art algorithms for face detection, benchmark them using standard datasets, and compare them. Then, an ensemble learning approach will be used to bootstrap the training of a Deep Learning architecture dedicated to face detection.

A2 - Evaluation of Skill-Learning Algorithms on Pepper

In recent years, many algorithms for the learning of motor skills have been proposed in the robotics literature (dynamic movement primitives, "end-to-end" reinforcement learning, ...). The goal of this internship is to evaluate the capabilities of the Pepper robot platform for skill-learning. Motor skills usually require precise object perception and localization (typically of the object to be manipulated). To circumvent this problem, experiments will be performed using a motion tracking system, which allows highly accurate tracking of robot and object positions.

A3 - Recognizing people with voice features

Recognizing a person is usually a task performed using visual processing (face detection and recognition), however the voice is a very important stream of information. This internship's goal is to investigate whether recognizing people using voice is possible and practical. First, the intern will make a literature review on this topic, and then will select promising approaches to implement and benchmark on a robot.

Fundamental Research

F1 - Saliency as error in a hierarchical generative model

Hierarchical Generative Models (HGMs) are a family of computational models recently proposed as a candidate to explain the brain's cortical processes. The prediction error in this architecture can be viewed as a signal representing a certain form of saliency. In an agent observing a visual scene, the saliency indicates regions where the hierarchical model is uncertain about what it observes. This should lead to motor actions in order to increase the quantity of information an agent has about this particular region, effectively reducing its saliency. In the context of this internship, an artificial visual retina will be used to build a HGM for visual signals, compute a saliency map based on the multi-layered error, and use this saliency map to generate saccades.

F2 - Reinforcement Learning Based on a Learned World-Model

Reinforcement learning methods allow agents to autonomously learn new behaviors. However, these algorithms require a compact (low-dimensional) representation of the state of the world. Unfortunately, in any realistic scenario, this state-space is actually very high-dimensional. How to best encode the state-space in a compact way is an open research question. At the Aldebaran AI Lab, we are developing a method that allows an agent to autonomously acquire a hierarchical world model. The goal of this internship is to couple this learning of a world model with reinforcement learning algorithms and to evaluate their performance.

F3 - Vision as a sensorimotor predictive model

Previous work at the Aldebaran AI Lab has addressed the development of visual perception from a sensorimotor point of view. It explains how a naive agent can control and classify uninterpreted sensory information based on sensorimotor regularities induced by a retina-like sensor. A first linear and discrete model has been proposed to tackle the problem and illustrate the approach. The goal of the internship is to extend this model to a non-linear and continuous formalism, and to evaluate it on a foveation task. The work will also imply investigating an original account of the nature of perception in robotics.

Details

Location: Paris, in Aldebaran headquarters

Duration: 5+ months

Profile: Engineering Diploma / Master of Science / Master of Research

Language: English is mandatory

Programming language: C/C++, Python or Matlab

Please send applications to ailab-internship@aldebaran.com with the following elements:

- Resume
- Short paragraph about your expectations for this internship
- A brief summary of your relevant experience