Takktile2 hand in a tri-manual setup as illustrated in the following figure. A Panda Franka Emika 7-DOF robotic arm, intel RealSense 435 RDB-D sensor, Reflex The robotic platform, which will be common for all research partners, is composed by demonstrating leading to at least one joint publication with other research partners. Researchers participating in the GentleMAN project for contributing to a final joint and the elaboration of a robotic closed-loop control law based on this matrix.

Observations (RGB-D images, contact position between the tools and the soft objects) study will concern the determination of this “deformation interaction matrix” from variation of the object deformation to the velocity of the robot contact tools. The perception will be studied by other research partners in GentleMAN. The PhD candidate is expected to explore new solutions that do not rely on the need of an accurate numerical model of the considered deformable object and that are compatible with robotic application in terms of computation cost. Unlike this work, we will focus mainly on the interaction between rigid robots and soft objects. The PhD candidate is expected to explore new solutions that do not rely on the need of an accurate numerical model of the considered deformable object and that are compatible with robotic application in terms of computation cost.

In this thesis, the candidate will propose a new methodology to control one or several robots interacting with a soft object for deforming it towards a desired shape. The envisaged methodologies will rely on the use of visual observation provided by a RGB-D sensor and data generated by tactile sensors. This latter aspect on tactile envisaged methodologies will rely on the use of visual observation provided by a RGB-D sensor and data generated by tactile sensors. This latter aspect on tactile

Recently, the control of soft robots made of compliant material has also become a new area of research. We can mention for example the research on inverse model of deformable robots. The proposed solutions are usually based on numerical simulations using finite element model (FEM) that have the drawbacks to be time consuming, to require complex models of the scene and also an accurate initialization of their boundary conditions and mechanical parameters. Unlike this work, we will focus mainly on the interaction between rigid robots and soft objects. The PhD candidate is expected to explore new solutions that do not rely on the need of an accurate numerical model of the considered deformable object and that are compatible with robotic application in terms of computation cost.

This thesis takes place in the context of a research collaborative project called “GentleMAN” whose main objective is to develop a novel framework for robotic manipulation of 3D compliant objects. The project stems from a highly interdisciplinary consortium composed of many well-established entities: SINTEF (Norway), NTNU (Norway), NMBU (Norway), MIT CSAIL (USA), Inria (France), and QUT (Australia).

Principal activities
In this thesis, the candidate will propose a new methodology to control one or several robots interacting with a soft object for deforming it towards a desired shape. The envisaged methodologies will rely on the use of visual observation provided by a RGB-D sensor and data generated by tactile sensors. This latter aspect on tactile perception will be studied by other research partners in GentleMAN. The PhD candidate will develop a new approach based on visual servoing that will rely on the determination of a so-called “deformation interaction matrix” linking the variation of the object deformation to the velocity of the robot contact tools. The study will concern the determination of this “deformation interaction matrix” from observations (RGB-D images, contact position between the tools and the soft objects) and the elaboration of a robotic closed-loop control law based on this matrix.

The PhD candidate is also expected to collaborate with the other PhD, PostDoc and researchers participating in the GentleMAN project for contributing to a final joint demonstrator leading to at least one joint publication with other research partners.

The robotic platform, which will be common for all research partners, is composed by a Panda Franka Emika 7-DOF robotic arm, intel RealSense 435 RGB-D sensor, Reflex Taktile2 hand in a tri-manual setup as illustrated in the following figure.
Compétences
The candidate must have an excellent track of records and a Master Degree (or equivalent) in robotics and computer vision.

The candidate must have the following qualifications:

- Strong background in robotics
- Experience with computer vision, physical robots, or 3D simulation
- Excellent programming skills in C++
- Excellent written and oral English
- Ability to perform experimental validations
- Ability to work independently as well as collaboratively

Please also send your list of marks (even preliminary) of your Master 2 or engineer formation with your CV and letter of motivation.

Avantages
- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours)
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Rémunération
Monthly gross salary amounting to 1982 euros for the first and second years and 2085 euros for the third year.