### Title
Designing adaptive and intelligent robots using Behavior Trees (BTs)

### Project Background
The Flagship Initiative 'Geriatronics – Robot Assistants for the Elderly' powered by the Munich School of Robotics and Machine Intelligence (MSRM) is driven by its vision to create intelligent assistants that support the elderly in long-term self-determined ageing.

The newly founded TUM Research Center Geriatronics is located in Garmisch-Partenkirchen, 90km south of Munich. With its geriatronics demo apartment, it is the initiative’s prime project location and offers a superb working environment for research and field test of robotic solutions for the elderly.

### Motivation
Central goal of the project is the development of an adaptive, humanoid service robot called GARMI for the preservation of self-determination in third life stage. GARMI should be able for perform simple everyday tasks in household environments. We propose behavior trees (BTs) to design and structure GARMI’s high-level task plan. BTs have been well proven in the game developer community to design the behavior of autonomous agents, being used in high profile video games such as Halo. Unlike a Finite State Machine (FSM), or other systems used for AI programming, a behavior tree is a tree of hierarchical nodes that control the flow of decision making of an AI entity, making task nodes both modular and reusable.

### Type
Bachelor / Master Thesis / Internship

### Tasks
The goal is to implement and evaluate a behavior tree for our GARMI prototype and model first tasks like setting the table or fetching an object. The research questions will be defined together with the student. Interesting questions can include: How can autonomous robot behavior be designed with behavior trees? How can tasks be modularized and decomposed (e.g. skills and actions)? How can behavior trees be generated based on teaching by non-expert users?

### Requirements:
- Good programming skills in C++ or Python
- Experience with Robot Operating System (ROS) – especially familiarity with topics, services and actions
- Basic understanding of robotics
- Experience in JavaScript (Node.js) is a plus
- Creativeness and ability to work independently

### Location:
Garmisch-Partenkirchen | no full-time presence needed – remote work possible

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### Keywords
behavior trees, artificial intelligence, robotics, task planning, intelligent agents

To apply please contact the supervision of your topic of interest via email to discuss further steps.