



Thank you for your interest in working with ScienceAtHome and/or the Center for Hybrid Intelligence.

The following projects can be research internships, bachelors, and masters thesis projects. A bachelors or masters thesis project can be more independent and research-based whereas a research internship can be more task-based with closer guidance and supervision.

Internships can range from 5-10 hours a week to full time.

All questions should be directed to:

Janet Rafner, Director of Learning janetrafner@phys.au.dk

Physics-related work

For a list of possible student projects in Physics please refer to the information on [Bachelor and Master's Projects here](#).

All Physics related questions should be directed to:

Carrie Weidner, Postdoctoral Research Assistant and Head of Physics Education
cweidner@phys.au.dk

Topic 1: Citizen Psych Science

Are online crowdsourcing projects in Psychology and Social Sciences actually Citizen Science? There is no consensus for this question. To properly evaluate and improve our ScienceAtHome projects we must have a well-defined framework, typology, and criteria for Citizen Psych-Science based on research and group discussions. An example of one of our citizen psych science games is Skill Lab: Science Detective. You will assist in the literature search and review, present findings of your theoretical research at stimulating group discussions, share your ideas, deeply engage with the theoretical foundations of our work while helping to advance them. Through this project with us, you will obtain the following: 1) valuable experience working in an interdisciplinary research group searching and reviewing scientific papers systematically, 2) widespread knowledge about CS 3) satisfaction in contributing to a project with wide reach and benefits for society.

Requirements:

- Write, read and speak fluent English
- Ability to read, understand, and search for various articles within CS, Psychology, Social Sciences, Cognition, and other relevant domains
- Familiarity with and/or interest in CS and game centered experimental designs
- Critical thinking in evaluating scientific papers
- Ability to clearly convey knowledge to others
- Curious, people-centered, creative mindset
- Ability to create diagrams and basic visualizations to convey your ideas (not mandatory, but helpful)

Topic 2: HCI and educational tools

We are working on an interactive, dynamic, and malleable digital tool to facilitate knowledge, co-creation and deep engagement with scientific research in both informal (Citizen Science) and formal educational settings (outreach workshops for students). We have developed an initial prototype that we have started to test in formal settings (workshops). You will work in close collaboration with the developer and an interdisciplinary team of researchers to help in defining user-centered ideas, then translate them for implementation in the actual product. This consists of building use cases, reviewing similar tools, going to meetings, continuously testing and helping to advance the prototypes, and assisting in preparations for workshops. Through this project with us, you will obtain the following: 1) valuable experience working in an interdisciplinary research group searching and reviewing scientific papers systematically, 2) widespread knowledge about CS 3) satisfaction in contributing to a project with wide reach and benefits for society.

Requirements:

- Write and speak fluent English
- Ability to place oneself in the shoes of a specified user group
- Being both creative and structured
- Ability to efficiently communicate, prioritize tasks, and organize workflow
- Familiarity with and interest in HCI, UX and Education
- Interest in the process of developing a digital tool
- Ability to see through a complex work process
- Ability to create diagrams and basic visualizations to convey your ideas (not mandatory, but helpful)

Topic 3: Creativity Games

We are producing a suite of creativity research games to further unfold and measure various aspects of creativity. We have begun initial research for this project. We need someone from a field similar to cognitive science or psychology with an interest in

experimental designs utilizing computer games. You will assist in the literature search, formulate creative experimental designs, and share your soon-to-be-acquired knowledge with others. You will learn to combine theoretical insights within product development and contribute to a project with high value for society.

Requirements:

- Write and speak fluent English
- Ability to read, understand, and search for various articles within psychology, cognition, and other parallel domains
- Familiarity with and interest in game centered experimental designs
- Think creatively and be interested in creativity research
- Ability to clearly convey knowledge to others
- Ability to create diagrams and basic visualizations to convey your ideas (not mandatory, but helpful)

Topic 4: Understanding and mapping 21st century skills

The lack of understanding of complex, contextual and nuanced skills like empathy, creativity, cooperation and others mentioned in the OECD framework (commonly referred to as 21st century skills or soft skills) has been identified as a fundamental roadblock in reaching some of the Sustainable Development Goals like 'Quality Education and Decent Work' and 'Economic Growth.' We propose using both large-scale, systematic studies of these skills as well as development and implementation of novel general-purpose software tools supporting real-world relevant, creative and collaborative challenges. First, we intend to create a sophisticated hierarchical process map of selected complex skills (for instance but not limited to empathy, creativity, and cooperation) through the lenses of education, cognitive science, creativity, and search (AI). Second, we move toward creating an open-source framework allowing a Citizen Science-based assessment (and measurement) of these skills. Finally, this work will lead us into developing gamified training modules combining insights from various fields to train and upskill for the future.

Requirements:

- Write and speak fluent English
- Be able to efficiently communicate, prioritize tasks, and organize workflow
- Ability to read, understand, and search for various articles within multiple domains
- Ability to clearly convey knowledge to others
- Experience and ability to create diagrams and basic visualizations to convey your ideas (not mandatory, but helpful)
- Interest and appreciation for the UN Sustainable Development Goals (not mandatory, but helpful)

Topic 5: Behavioral Economics and SDGs

We at ScienceAtHome are in the process of establishing a behavioral economics game lab dedicated to scientifically investigating the complex social interactions within the UN SDGs (<https://www.un.org/sustainabledevelopment/sustainable-development-goals/>). The theme of every game will be developed in close collaboration with relevant partner NGOs and international institutions. This ensures that the concrete games along with the generated insights developed within this project can be readily adapted to real-world interventions in subsequent steps. This work will have a focus on nudging in complex environments.

In this work you will explore behavioral economics in relation to the SDGs and utilize the SAH games on collective resource distribution to augment the Smithsonian Science For Global Goals (<https://ssec.si.edu/global-goals>) learning modules. You will assist in the literature search and review, present findings of your theoretical research stimulating group discussions, share your ideas, and deeply engage with the theoretical foundations of our projects and games while helping to advance them.

Requirements:

- Write and speak fluent English
- Have experience with bibliographic search and research.
- Have experience with behavioral economics
- Familiarity with and/or interest in Citizen Science and game centered experimental designs
- Interest and appreciation for the UN Sustainable Development Goals
- Interest in being involved in an international collaboration with researchers, practitioners and policymakers
- Think critically and creatively
- Ability to clearly convey knowledge to others
- Ability to create diagrams and basic visualizations to convey your ideas (not mandatory, but helpful)

Topic 6: Developing digital tools for Hybrid Intelligence

With the advent of AI, one of the greatest challenges facing humanity is developing hybrid-intelligence (HI) interfaces that optimally combine algorithmic power with distinctly human skills. We propose the development and implementation of novel general-purpose software tools supporting real-world relevant, creative and collaborative challenges. These HI interfaces for complex problem solving will be adapted optimally to individual cognitive profiles (hyper-personalization). Additionally, these platforms will grant access to HI for people who otherwise would not have the opportunity to learn or experience these systems on their own terms. This, in turn, prepares them to thrive and prosper without losing the innate sense of human uniqueness and value in our science and technology-driven world.

We began exploring hybrid intelligence within Quantum Moves 2, giving players access to the complex optimization algorithms. We now seek to expand this trend within Quantum Moves 2 and our other projects, including the Citizen Science Notebook and our suite of creativity-related games. Features will include suggesting tools based on the individual level of exploration/exploitation in creative problem solving, personalized in-game messages and overall adaptations to the user interface.

Additionally during this project, one would be researching the most complex cutting edge human-algorithmic interactions.

Requirements:

- Write and speak fluent English
- Ability to read, understand, and search for various articles within psychology, cognition, AI, and other parallel domains
- Familiarity with and interest in game centered experimental designs
- Ability to clearly convey knowledge to others
- Ability to create diagrams and basic visualizations to convey your ideas (not mandatory, but helpful)
- Familiarity with and/or interest in Citizen Science and game centered experimental designs

Topic 7: Skill Lab: Large scale gamified cognitive profiling

This past year ScienceAtHome introduced the first version of a game-based cognitive mapping platform, Skill Lab: Science Detective (SLSD). Developing games for SLSD requires an exhaustive bibliographic search of psychological theories and psychological evaluation techniques. Within the coming year, we hope to turn SLSD into the world's first ever 'wide' and 'deep' computational mapping platform, by validating the gamified tasks around basic psychological processes and executive functions and by expanding the mapping to the otherwise elusive domain of complex, contextual and nuanced skills (e.g. creativity). Additionally, we are expanding the use of SLSD to clinical trials. As part of this project you will help to advance our work through the following: 1) assist in the literature search and review 2) present findings of your theoretical research, and 3) participate in lively group discussions. In this project, you will have the opportunity to learn about how psychology and game design are linked, and how cognitive skills can be evaluated by using video games. You will be participating in meetings regarding psychology, game design, and game development.

Requirements:

- Have experience with bibliographic search and research.
- Have experience with experimental methods in psychology

- Write and speak fluent English
- Understand principles of general psychology or neuropsychology
- Be good at critical and creative thinking
- Familiarity with and/or interest in Citizen Science and game centered experimental designs
- Be a gamer (not mandatory but beneficial)

Topic 8: ReGAME: Research-Enabling Game-Based Education

Based on educational material developed around our citizen science games we have over the past year introduced a novel educational paradigm, Research-Enabling Game-Based Education (ReGAME), into the formal Danish educational system. Unlike conventional game-based education, we do not aim to make learning fun but rather to make it epic and deeply engaging by linking core curriculum components to state-of-the-art research challenges. In December 2018, we launched the first version of educational modules on quantum physics, turbulence, statistics, psychology and behavioral economics in a national student competition, ReGAME cup18, in which 200+ teams in grades 7-10 and 1g-3g competed to collect the most points from both gameplay and answering the educational questions.

In the process, we collected some statements regarding the feeling and use of ReGAME implementation from professors and students in order to conduct qualitative research. Your contribution to this project will be helping with the translation of interviews and qualitative data analysis. In this project, you will have the opportunity to learn more about didactics and education, as well as learning and practicing qualitative data analyses of semi-structured interviews.

Requirements:

- Write and speak fluent English and Danish
- Know, or be motivated to learn, qualitative techniques for analyses of semi-structured interviews
- Know, or be motivated to learn the use of specialised software for analyses of qualitative data.
- Have experience with bibliographic search and research.