

PhD Summer School in Neurotechnology



SOZOPOL 26 - 30 MAY 2025

SUMMER SCHOOL



**Bridging Implants, Non-Invasive BCIs
and Neuroinformatics**



May 26th - 30th
Hotel Villa List, Sozopol, Bulgaria



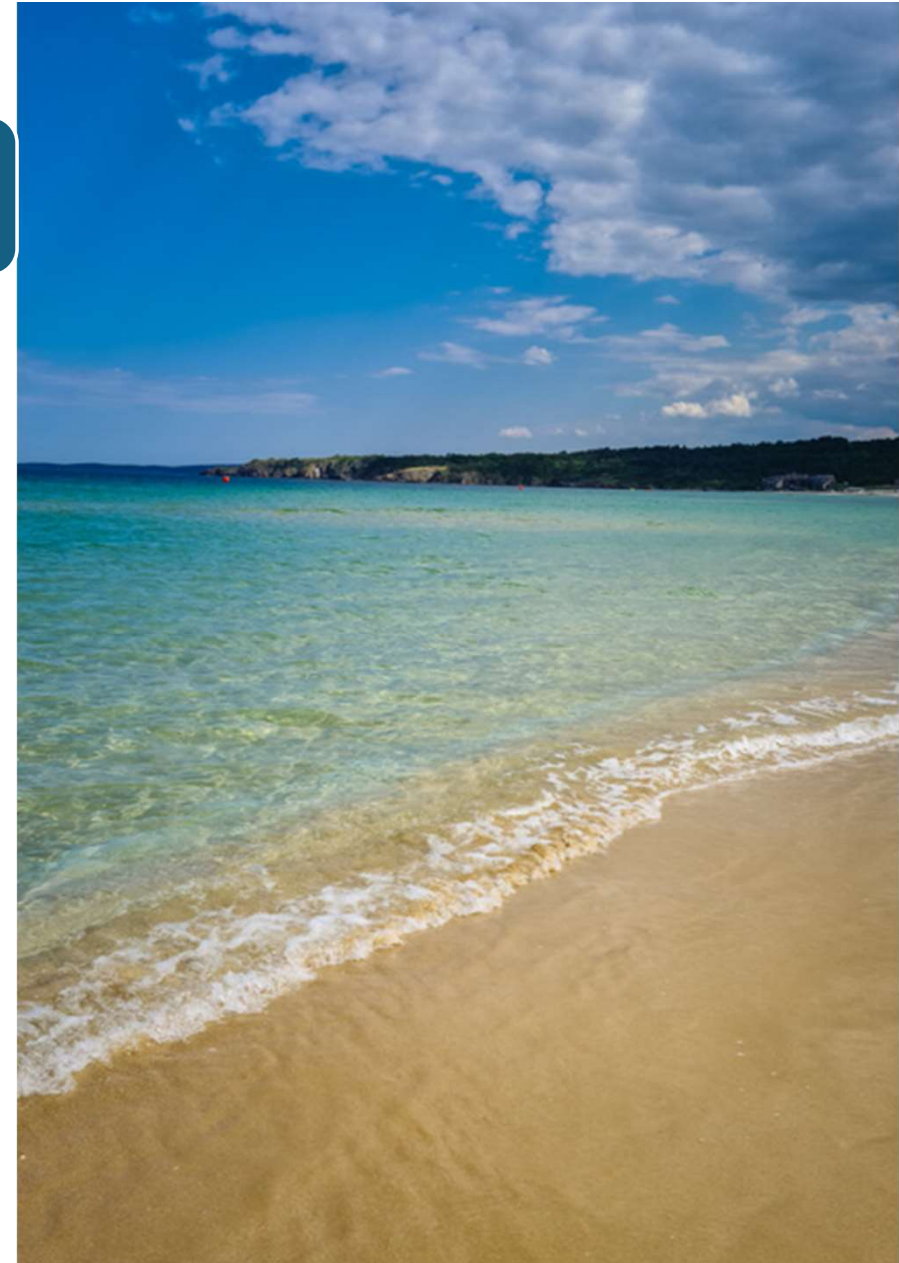
ЗА ЛЯТНОТО УЧИЛИЩЕ

- Организираното от VIBraTE лятно училище предлага цялостна 5-дневна образователна програма, фокусирана върху авангарден напредък в невротехнологиите, включително невронни импланти, интерфейси мозък-компютър (BCI) и невроинформатика.
- Целта е да се осигури задълбочено разбиране на най-новите постижения и изследователски методологии в областта на невронните импланти, неинвазивните мозъчни компютърни интерфейси (BCI) и невроинформатиката. Участниците ще се включат в лекции, практически семинари и съвместни проекти, които ще им дадат знания и умения, за да допринесат за авангардни изследвания в областта на невротехнологиите.
- Очаква се участниците да взаимодействат с лекторите по време на събитието. Като организатори се надяваме, че това събитие ще катализира бъдещи изследвания, като потенциално ще допринесе за напредъка на BCI изследванията, както в България, така и в международен план.



ЗАЩО ДА УЧАСТВАТЕ?

- Придобийте задълбочени познания от водещи експерти в невротехнологиите.
- Участвайте в практически семинари и казуси за бъдещи приложения.
- Създайте контакти с международни експерти от академичните среди, индустрията и здравеопазването.
- Подобрете кариерата си чрез съвместни проекти и експертна обратна връзка.
- Език: английски



26 May 2025 - Introduction to Neurotechnology and Neural Implants (Day 1)

- **Morning Session:**
 - **Welcome & Introduction:** Overview of the format, goals, and expected outcomes.
 - **Keynote Lecture 1:** Prof. Ivan Minev *Materials and Technologies for Soft and Multimodal Neural Implants*
 - **Keynote Lecture 2:** Dr Arno Aarts *Introduction to Neural Implants: Types and Applications* - An overview of various neural implants, including deep brain stimulators, cochlear implants, and cortical implants.
- **Afternoon Session:**
 - **Exhibitor/ Sponsor presentation**
 - **Roundtable:** participants present themselves and their cases
 - **Group Activity:** *Brainstorming Future Applications* - Participants are divided into groups to brainstorm potential future applications of neural implants, focusing on interdisciplinary collaboration.
 - **Group Project Kick-off:** Participants will be divided into interdisciplinary teams to work on projects that integrate implants, BCIs, and neuroinformatics, to be presented on Day 5.
- **Evening:** Networking Reception & Poster Session



Prof. Ivan Minev

Head of Research Division
"Electronic Tissue Technologies"

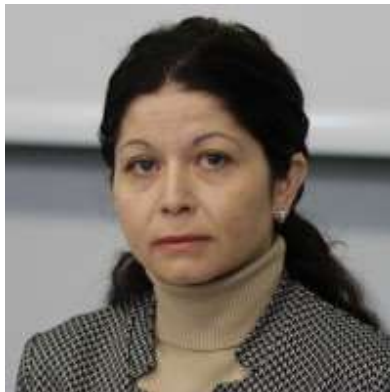
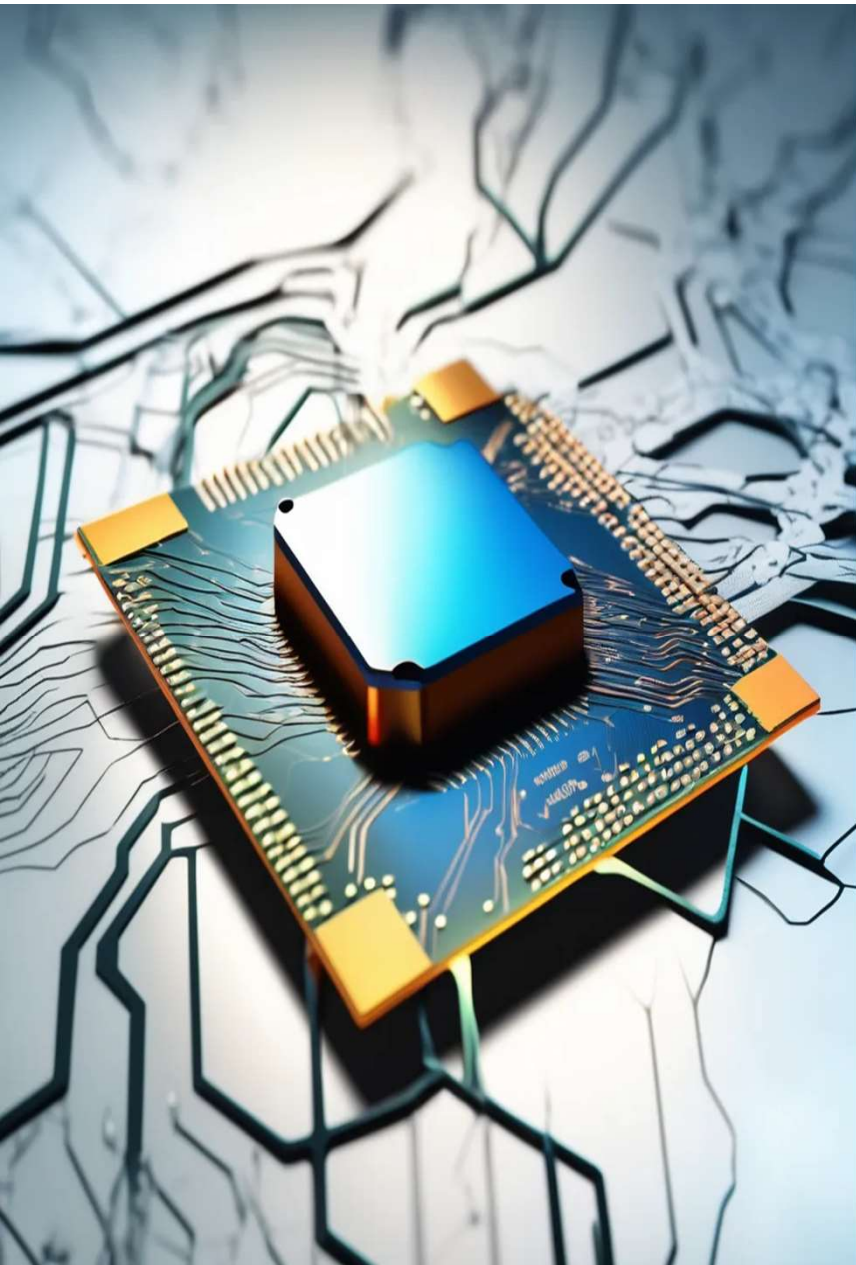


Our main interest concerns building the hardware that will underpin next generation bioelectronic interfaces. The main challenge we address is the seamless merging of living matter and machine. If this can be achieved, long standing challenges relating to biointegration, reliability and limitations in the quantity and type of information exchange may be resolved.



Dr Arno Aarts
CEO at ATLAS
Neuroengineering

ATLAS Neuroengineering provides solutions for the experimental neuroscience to record and stimulate neuronal activity and offer high-density, silicon-based neural probes and peripheral. Our main know-how is silicon microfabrication, system integration, biocompatibility and histology.



Prof. Valentina Markova
Head of the Department of
Communication
Engineering and
Technologies, Technical
University of Varna.

Научните и интереси са в
областта на
комуникационните
вериги, системите за
събиране на данни,
биомедицина,
компютърно проектиране
и моделиране. Автор е на
над 70 публикации у нас и
в чужбина. Участва в
редица
научноизследователски
проекти, финансирани от
национални и
международни програми.

27 May 2025-Advances in Non-Invasive Brain-Computer Interfaces (Day2)

• Morning Session:

- **Lecture 3:** Prof. Valentina Markova *Fundamentals of Non-Invasive BCIs: EEG, fNIRS, and Beyond* - An introduction to non-invasive BCIs, exploring various modalities like EEG, fNIRS, MEG, and their respective strengths and limitations.
- **Case Studies:** *Clinical and Non-Clinical Applications of BCIs* - Presentation of case studies where non-invasive BCIs have been successfully applied, such as in rehabilitation, communication for ALS patients, and neurofeedback.

- Lunch

• Afternoon Session:

- **Workshop:** *Using a BCI System* - Participants will work in teams to set up a basic BCI system, acquiring and analyzing EEG signals to control a simple interface.
- **Workshop:** Prof. Dimiter Prodanov - *Ethics and Societal Impacts of BCIs* - A moderated discussion on the ethical considerations, privacy concerns, and societal implications of widespread BCI adoption.

28 May 2025 - Neuroinformatics and Data Analysis (Day 3)

- **Morning Session:**

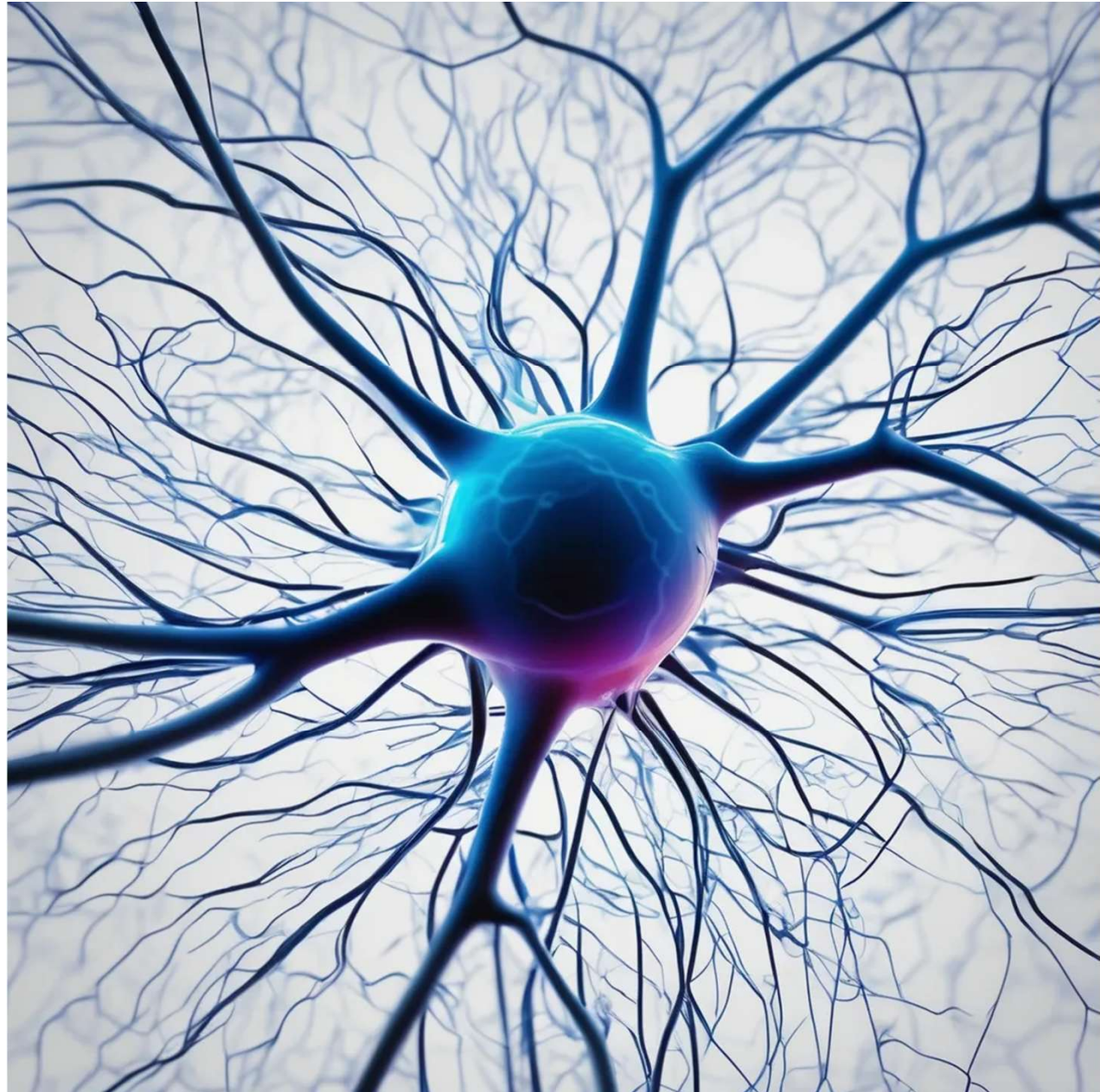
- **Lecture 4: *Introduction to Neuroinformatics: Tools and Techniques*** - Overview of neuroinformatics, covering data acquisition, storage, processing, and sharing. Introduction to major initiatives, such as INCF Training Space, EBRAINS, etc.
- **Lecture 5: *Machine Learning in Neurotechnology*** - Exploring the role of machine learning in analyzing neural data, including feature extraction, classification, and predictive modeling.

- Lunch

- **Afternoon Session:**

- **Workshop: *Neuroinformatics Data Pipeline*** - Participants will work on processing real neural data using neuroinformatics tools. The focus will be on data cleaning, standardization, and preliminary analysis.
- **Team Work:** Group project development continues with mentor feedback.

- **Evening:** Social Event - Cultural Excursion





29 May 2025 - Integrative Approaches and Emerging Trends (Day 4)

- **Morning Session:**

- **Lecture 6: *Integrating Implants and BCIs: Hybrid Systems*** - Discussion on the convergence of invasive and non-invasive approaches, hybrid systems that combine the strengths of both, and the potential of these systems in personalized medicine.
- **Panel Discussion: *Emerging Trends in Neurotechnology*** - Panel with experts from academia, industry, and healthcare discussing the future directions of neurotechnology, including closed-loop systems, neuromodulation, and neuroprosthetics.

- Lunch

- **Afternoon Session:**

- **Lecture 7: *The Intersection of AI and Neurotechnology***
- **Team Work:** Group project development continues with mentor feedback.

- **Evening:** Group Dinner



30 May 2025 - Project Presentations and Future Directions (Day 5)

- **Morning Session:**

- **Roundtable Discussion:** *Translating Research to Real-World Applications* - A discussion about the pathway from research to clinical and commercial applications, including regulatory challenges and the importance of interdisciplinary collaboration.
- **Roundtable Discussion:** *Building a Career in Neurotechnology* - Insights and advice from established researchers and industry professionals on navigating an academic or industry career in neurotechnology.

- Lunch

- **Afternoon Session:**

- **Group Project Presentations:** Each team presents their project integrating implants, BCIs, and neuroinformatics. Presentations should cover the problem addressed, the interdisciplinary approach taken, and potential impacts.
- **Feedback Session:** Participants receive feedback from peers and experts.

- **Closing Ceremony:**

- Certificate distribution, final remarks, and a summary of key takeaways from the week.
- Farewell reception and networking opportunities.



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Вземете бъдещето си в своите ръце!