STEAM: The Next Generation Triggers Education Program

Vicky Batsari, Felice Pantaleo nextgen-steam@cern.ch



Overview of the STEAM Program

What is STEAM?

• CERN Software Training, Education, and Advanced Modules

Purpose:

- Equip postgraduate students, Ph.D. scholars, and researchers with cutting-edge software skills
- Focus on algorithms, AI, trigger systems, advanced computing as applied to HEP

Vision:

• Ensure a vibrant future for research by enhancing software proficiency



The team



Felice Pantaleo Leader of Task 4.2



Vicky Batsari Graduate (Origin)

Do not hesitate to contact us at nextgen-steam@ cern.ch

Oron

Mattermost



Objectives of the STEAM Program

- Develop a year-long educational program:
 - Topical lectures, seminars, dedicated schools
 - Hands-on training courses in software tools and techniques
- Engage professors, researchers and experts, collaborate with universities and industrial partners
- Create opportunities for the exchange program (Task 4.1)



Phases of the Program

- Preparatory Phase (2 years):
 - Establish Program Committee
 - Conduct skills gap analysis
 - Develop course modules and training materials
- Implementation Phase (3 years):
 - Official launch of the STEAM Academy
 - Regular lectures, seminars, and dedicated schools
 - Hands-on sessions and practical experience
 - Continuous assessment and refinement



Growing Network of Schools





Formation of Committees

STEAM Program Committee:

• Responsible for development and implementation

STEAM Program Advisory Board:

- Provides guidance and strategic recommendations
- Ensure program effectiveness and relevance
- Foster collaboration and avoid redundancy with existing programs



Mandate of the STEAM Program Committee

Development and Implementation:

- Create and execute the STEAM education program Organize training events, schools, seminars, hackathons

Curriculum Design:

- Address specialized training needsRecommend effective training methodologies

Operational Involvement:

- Coordinate logistics and scheduling Facilitate collaboration among NGT Work Packages and Experiments

Collaboration and Engagement:

- Engage experts from CERN openlab industrial partners
 Engage professors from universities



Mandate of the STEAM Program Advisory Board

Program Review and Evaluation:

- Assess curriculum and training methods Align program with industry and academia trends

Strategic Recommendations:

- Enhance program based on best practices Improve curriculum design and resource utilization

Curriculum Coherence and Gap Analysis:

- Coordinate with existing schools to avoid overlaps Identify and fill educational gaps

Quality Assurance and Networking:

- Facilitate external relations and collaborations
- Monitor outcomes and suggest metrics



Skills Gap Analysis - Survey Results

Advanced Training Requests from Task Leaders:

Parallel, High-performance, and High-throughput Computing:

- Parallel programming fundamentals
- Optimization techniques for HPC and HTC
- Heterogeneous architectures (GPUs, FPGAs)
- FPGA programming

C++/Data-intensive applications:

- Efficient memory usage
- Expert-level of \acute{C} ++ and Accelerated Python
- Big data handling
- Data Preparation, tools

Machine Learning and AI:

- Advanced neural networks
- Optimization of neural networks



Skills Gap Analysis - Interviews

Interviews with NGT hired students and graduates:

- Need for FPGA design knowledge
- GPU programming and efficient memory usage
- HPC and HTC communication
- Advanced ML concepts and architectures
- Advanced courses on specific tools (e.g., Performance portability)

Additional Requests for Basic Training:

- Introduction to event reconstruction, behind computing tasks for Computer Scientists
- Introduction to experimental frameworks (e.g. Athena, CMSSW, Gaudi)
- Practical, hands-on hackathons with real problems



Skills Analysis Gap - Three Branches to Cover

The main branches:

- High Throughput/Real-Time Computing
- Data Science, Data Preparation Libraries, Methods, and Tools
- Advanced Neural Networks

Plan:

- Work with committees to determine the best delivery methods
- Develop targeted training modules for each branch





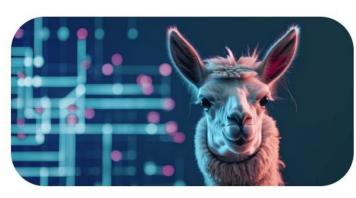
Activities

News & Events

Resources

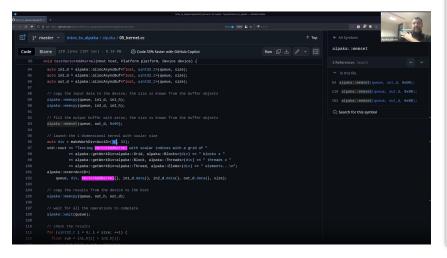
Our Learning Hub

Jobs



Alpaka Tutorial

By Andrea Bocci







Basic Trainings



Advanced Seminars



Next Steps and Future Plans

Feedback:

- Your feedback is very valuable for us
- If you have attended a NextGen-sponsored training, a **very short** feedback request form will be sent to you next week

Contributions:

- Seeking additional introductory tutorials and materials for the website
- Contact us if you have content to share

Hackathons:

• Organizing hackathons for 2025

Continuous Training:

- Developing training modules for identified needs
- Continuous collaboration with committees
- Engagement with Industrial Partners and Universities





- The STEAM training program aims to equip all NGT members with essential and advanced skills
- We focus on fostering cross-collaboration and providing continuous learning opportunities
- All NGT members are encouraged to actively participate in the training sessions, workshops, and hackathons

! Subscribe to nextgen-steam-news egroup to receive updates !



