

Training modules for SMEs - Module 1 "Introduction to Artificial Intelligence and High-Performance Computing"

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Type: **not specified**

AI on HPC: Revolutionizing Machine Learning Applications

Thursday, 6 March 2025 12:00 (20 minutes)

- **Introduction to AI & HPC.** Discuss the synergy of AI and High-Performance Computing (HPC), focusing on their combined role in accelerating data processing and enabling complex computations.
- **Benefits of AI and HPC Integration.** Highlight advantages such as faster processing of large datasets and enhanced innovation in sectors like healthcare, finance, and environmental science through precise simulations and data analysis.
- **Overcoming Challenges in AI & HPC.** Address key issues like energy consumption, data management, and security. Discuss how integrated solutions are fostering more sustainable and secure computing practices.
- **Future Advancements.** Explore anticipated developments in AI algorithms and HPC infrastructure, predicting their impact on scientific research, engineering, and business analytics, and the potential for new computational possibilities.
- **Stochastic Gradient Descent (SGD).** Explain the concept of SGD, its benefits in optimization for AI, and how the stochastic nature aids in escaping local minima for better results in non-convex problems.
- **Parallel Processing and Scalability in HPC.** Discuss the role of parallel computing in enhancing AI training efficiency, especially through technologies like Parallel Stochastic Gradient Descent (PSGD) across distributed GPU and CPU resources.
- **Challenges in Hyperparameter Tuning.** Address the complexity of hyperparameter tuning in machine learning within HPC environments and strategies to optimize this process efficiently.
- **Real-World Applications of AI & HPC.** Provide examples of practical implementations such as generative AI, large language models, time-series analysis, and optimization, demonstrating the transformative potential across different industries.
- **The Infinite Possibilities.** Conclude with a discussion on the endless applications of AI and HPC—from predictive analytics to autonomous vehicles—underlining the role of this integration in shaping future technologies and societal advancements.

Presenter: Mr BAKAS, Nikolaos (GRNET)