OppenFynn Innovation Labs®

Comprehensive Course on Quantum Machine Learning

Deep Dive into the world of Quantum with OppenFynn Innovation Labs

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About Us

OppenFynn Innovation Labs®

- **OppenFynn Innovation Lab is a GST & MSME-registered partnership firm, established in 2021. Founded and incubated by alumni of prestigious institutions such as the Indian Institute of Science, Bangalore (IISc), and IIM Kashipur, we have successfully conducted numerous training programs, Faculty Development Programs (FDP), and Skill Development Programs (SDP) at renowned institutions, including VIT Vellore.**
- **We offer industry-relevant certification courses with hands-on sessions in Data Science, Machine & Deep Learning, Generative AI, Natural Language Processing, Quantum Machine Learning, Financial Data Analytics, and Quant-based Stock and Option Trading Course. Our faculty, with extensive experience in both academia and industry, are experts in these fields.**
- **Our firm holds trademarks registered under Classes 41 and 42 of the Indian Trade Mark Act, underscoring our commitment to providing high-quality education and training.**
- **We are dedicated to empowering the next generation of technocrats by delivering state-of-the-art skill and career enhancement courses. Our curriculum covers a broad spectrum of topics, from the fundamentals of probability and statistics to advanced, hands-on programming sessions in leading technologies.**
- **Through personalized mentorship, we ensure a deep understanding of complex concepts.**

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Why Choose the Quantum Machine Learning Course

- **Advanced Problem-Solving Skills:** Learn to tackle complex computational problems using quantum algorithms, offering potential speed-ups over classical methods.
- **Interdisciplinary Knowledge:** Combines quantum computing and machine learning, enhancing expertise in both cutting-edge fields.
- **Future-Ready Skills:** Prepares you for emerging technologies and industries leveraging quantum advantages.
- **Innovative Applications:** Exposure to unique applications like quantum image processing and generative models, which are not feasible with classical systems alone.

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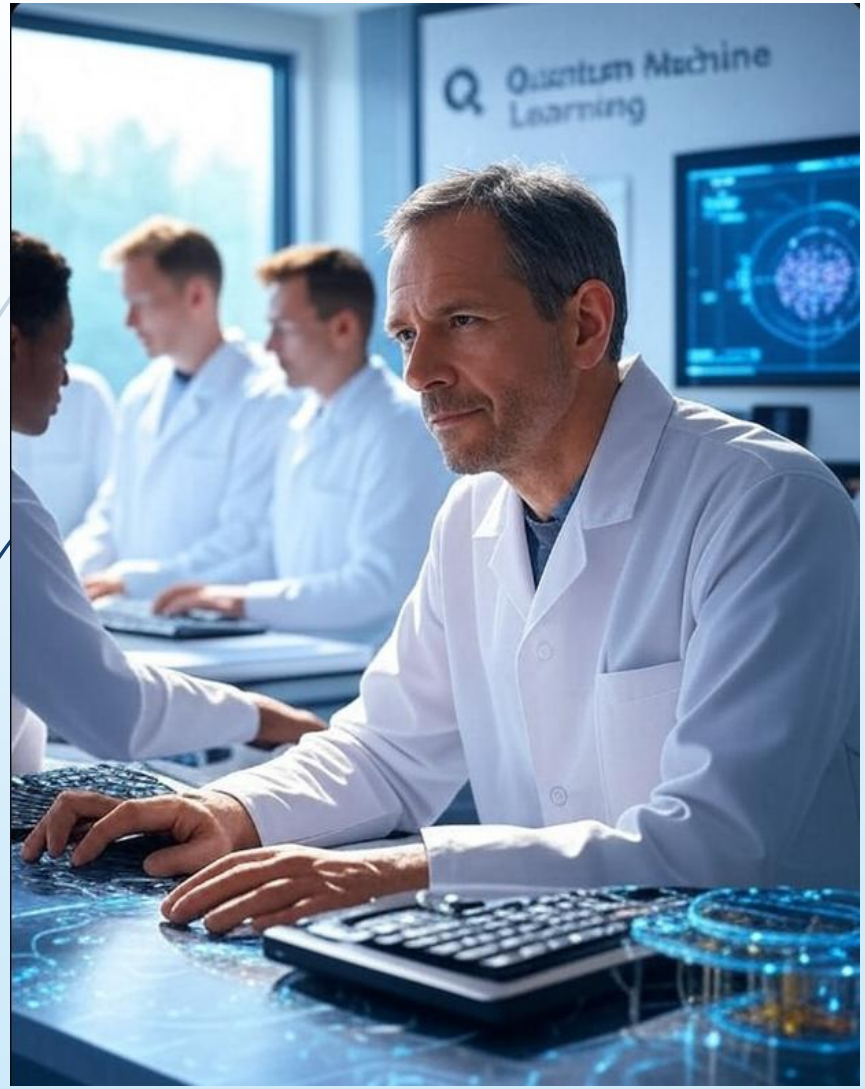
Detailed Syllabus



Quantum Machine Learning

- The course begins with a refresher on classical machine learning concepts and terminology. The course will then explore the unique advantages of quantum machine learning, with a focus on quantum image processing algorithms such as edge detection and image compression.
- Participants will also dive into quantum support vector machines, learning the underlying mathematics and concepts, with an example centered on the max-cut problem. The phase concludes with an introduction to quantum neural networks (QNNs), including quantum convolutional neural networks and quantum generative adversarial networks (qGANs), with applications ranging from handwriting recognition to option pricing. As in Phase 1, this phase includes Qiskit lab exercises and Qiskit code for all examples discussed.
- This comprehensive approach ensures participants gain both theoretical knowledge and practical skills in quantum computing and quantum machine learning.

Quantum Machine Learning:

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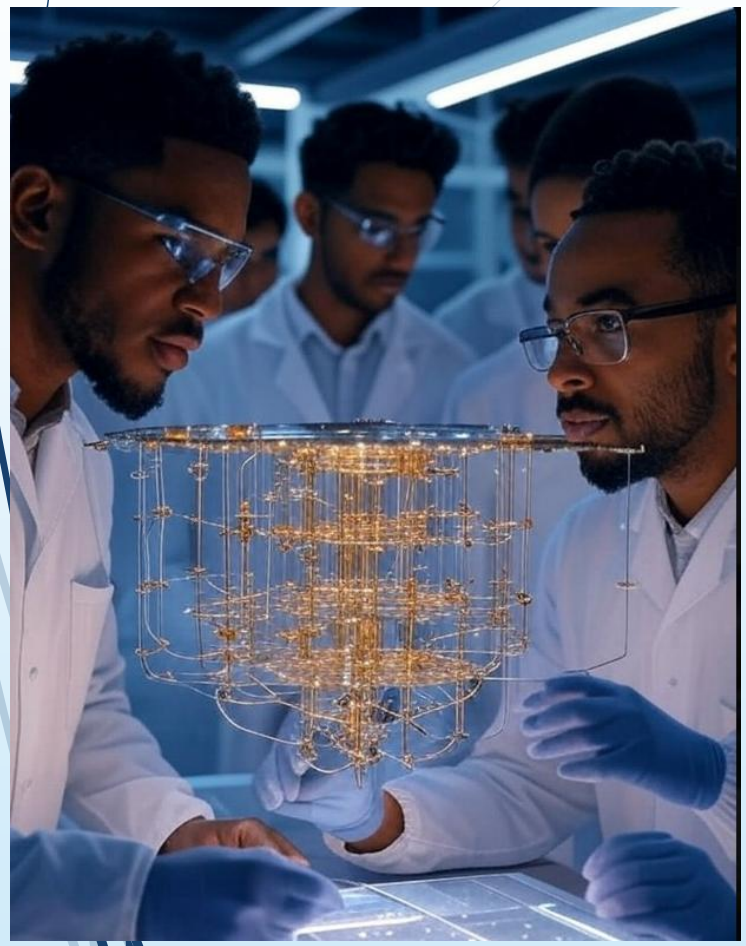

- Quantum machine learning overview: supervised/unsupervised learning, clustering, classification and regression.
- Quantum Image Processing: Image edge encoding techniques (FRQI, NEQR, QPIE), Hadamard edge detection, image compression (quantum JPEG)
- Quantum support vector machine (QSVM): Cost function, Ising Hamiltonian, kernel trick, Max cut problem
- Quantum neural networks (QNN): Classical CNNs, Quantum convolutional neural networks (QCNN), edge detection, handwriting recognition
- Quantum generative adversarial networks (qGAN): Generator, discriminator, quantum generators for distribution prediction.

Course Outcomes

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- Upon completion, you will be able to: Understand the principles of supervised/unsupervised learning, clustering, classification, and regression in a quantum context.
- Apply quantum image processing techniques (e.g., FRQI, NEQR, QPIE, Hadamard edge detection, quantum JPEG) for advanced image analysis.
- Implement quantum support vector machines (QSVM) and related concepts (cost function, Ising Hamiltonian, kernel trick, max cut problem) for optimization tasks.
- Design and utilize quantum neural networks (QNN) and quantum convolutional neural networks (QCNN) for tasks like edge detection and handwriting recognition.
- Develop quantum generative adversarial networks (qGANs) for distribution prediction and option pricing, leveraging quantum generators and discriminators.

Know your Faculty

- ***Dr. Arjun Shetty - B.Tech(MIT - Manipal), M.Tech (IIIT - Hyderabad), PhD(IISc Bangalore), Postdoctoral(Institute for Quantum Computing - Canada)***
- ***He will be the principal faculty for the course***

Principal Faculty:

1. Dr. Arjun Shetty *B.Tech (MIT - Manipal), M.Tech (IIIT - Hyderabad), PhD(IISc Bangalore), Postdoctoral(Institute for Quantum Computing - Canada)*

- Arjun Shetty is a Postdoctoral Fellow at the Institute for Quantum Computing, University of Waterloo, Canada.
- Presently working as a ***Yield Development Engineer at Intel Corporation.***
- Experienced Research And Development Engineer with a demonstrated history of working in the semiconductors industry. Skilled in semiconductor device physics, nanofabrication, material and device characterization
- He obtained his Ph.D. from the Centre for Nano Science and Engineering, Indian Institute of Science in the area of III-nitride semiconductors.
- Post his Ph.D., Arjun worked as a Sr. Device Engineer at Sandisk India Device Design Centre, Bangalore for two years.
- His work at SanDisk was focused on silicon NAND flash memory device reliability.
- After that, he moved to his post doctoral at the University of Waterloo.
- His research interests broadly span III-V semiconductors, quantum semiconductor devices, low dimensional quantum transport, optoelectronics and semiconductor device modelling.

Prerequisites

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- Minimum Educational Qualification Expected from the candidates enrolling for the course is Graduation in any stream of Science/Engineering
- Basic Programming interest will be required to understand all the modules under Phase 2.
- An Interest and Inclination to Learn new concept.
- Critical analytical thinking will be required to understand the concepts.
- Candidates Enrolled are required to attend at least 85% of classes to understand the concepts.
- Candidates should be comfortable with Spoken English as all the classes will be conducted in English.

Course Fee

- Class Duration: Three Months (10-12 weeks)
- Class Schedule: 2.5 Hours a week: Online live classes with recordings access for 1 year.
- Timings : Saturday 7– 9.30 PM IST (Tentative)
- Course Fees:

i. For the entire course covering both the Phases INR 12,500/- +18% GST = **INR 14,750/-** (course will be covered in 4 Months/ 16 weeks)

ii. For self phased pre-recorded course= INR 4000/- +18% GST = INR **4720/-** (no live classes only course recordings will be provided under this scheme, however we can arrange for a couple of doubt clearing sessions)

Payment Terms

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- Full amount to be paid at the beginning of the course and no partial payment will be entertained. Course will be confirmed through confirmation mail on receipt of full payment.
- Fee Once Paid will not be refunded under any circumstances
- Payment details

OPPENFYNN INNOVATION LABS (GSTIN: 29AAHFO2616F1ZB)

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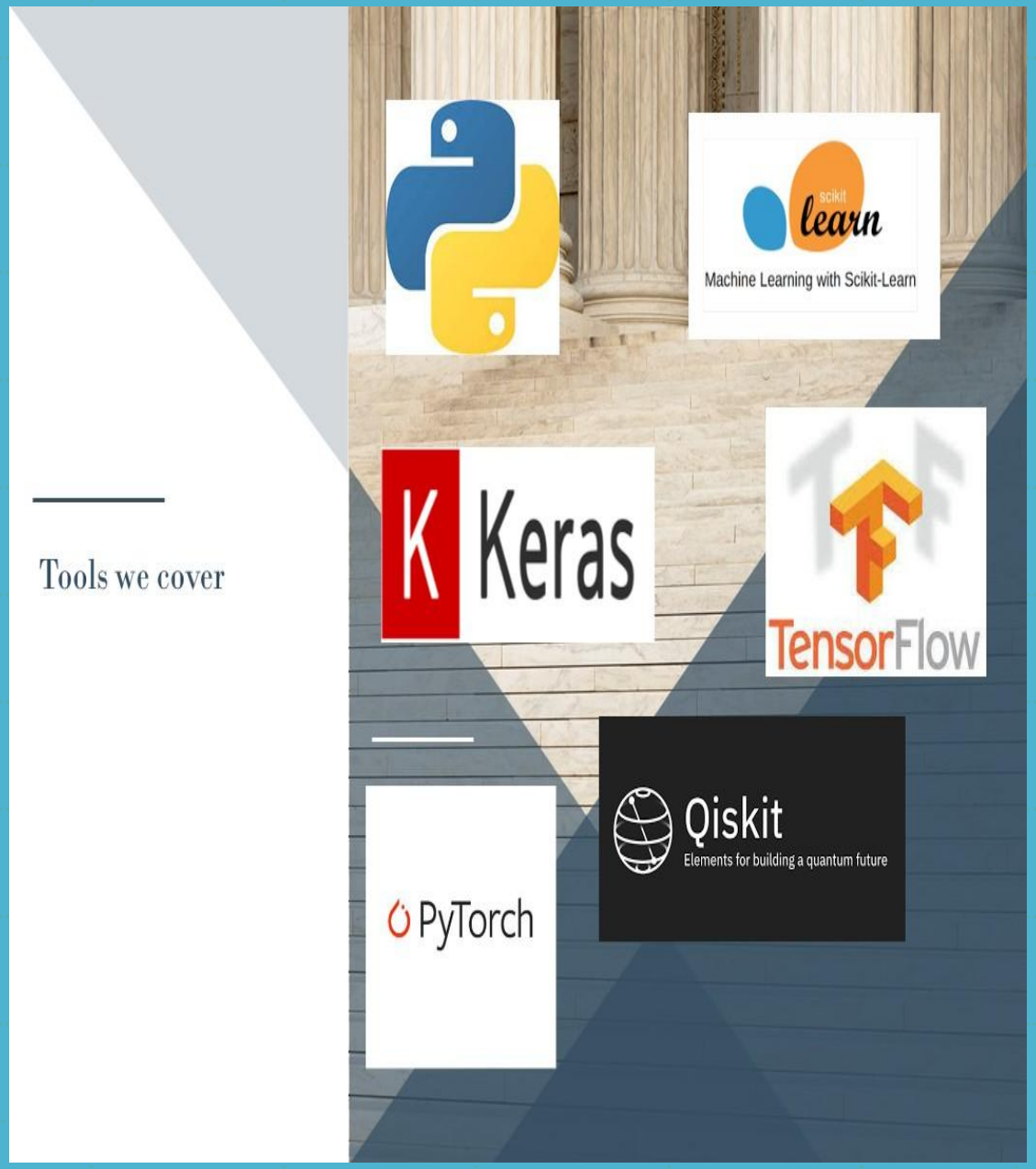

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Thank You