AMRITA VISHWA VIDYAPEETHAM

DEEMED TO BE UNIVERSITY UNDER SECTION 3 OF UGC ACT, 1956

We cordially invite faculty members and students to register for the one-day workshop on AI readiness, organized by Amrita School of AI, to be held on campus at AB4 on 20 April 2026 at Amrita Vishwa Vidyapeetham, Coimbatore campus.

Registration is free of charge.

Time : 9AM – 6PM

Date : 20 April 2026

Topics

1. **Introduction to need for Data structures with data compression**
2. **CR decomposition to RKS algorithm for ML**
3. **Covariance to SVD to PCA to Variational Auto encoder**
4. **DL without agonizing pain - Pseudo Inverse learners**
5. **Projection to Diffusion models(Generative AI)**
6. **Transformers and LLM.**

Registration is open till 18th April 2026

Registration is on first come first serve basis.
Only limited seats available !

Forthcoming workshop

ASIC design for kids

Future pathway for ASIC designer

An Application-Specific Integrated Circuit (ASIC) is a customized chip designed for a particular, specialized use rather than general-purpose tasks. Synonyms include specialized ICs or application-optimized silicon. Used in AI, cryptocurrency mining, and smartphones, they offer high speed and power efficiency.

Future pathway for ASIC designer

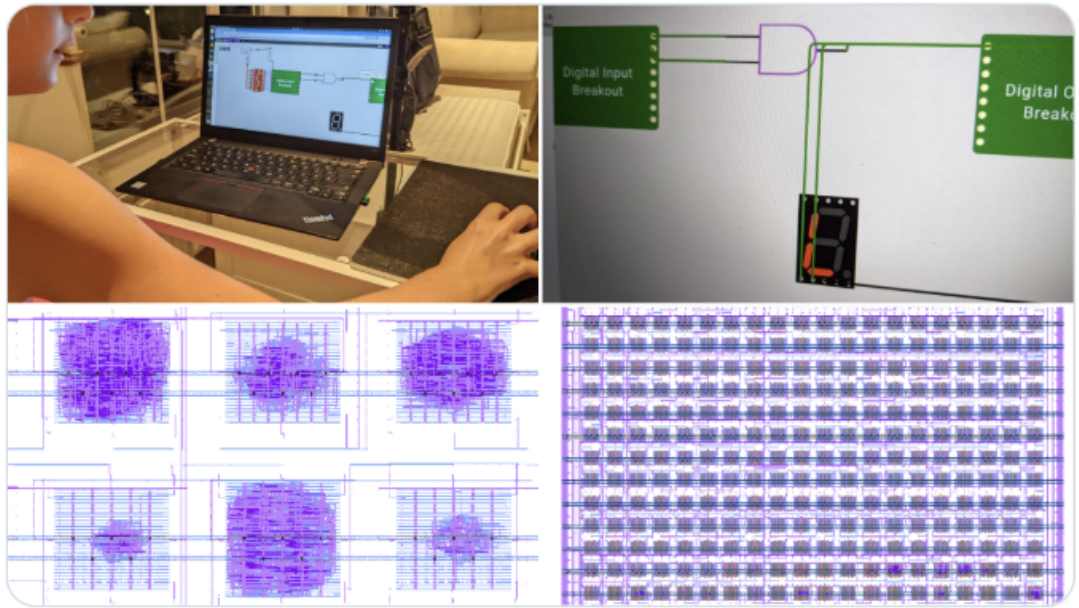
Experience	Student Level	Budget (USD)	Node
First	Middle School	<$20	180nm
Second	High School	$20 → $1,000	130nm
Multiple	Undergrad	$100 → $10,000	45nm*
Advanced	Masters	>$10,000	12nm*
Leading Edge	PhD	>$50,000	7nm / 5nm

* Investment needed…

Matthew Venn
@matthewvenn

9 year old

Living in a world where my 9 year old can design a chip! tinytapeout.com #tinytapeout



5:46 AM · Sep 4, 2022

logic destroyer @splinedrive · Feb 1

9 year old

So guys, my TT07 **TinyTapeout** ASIC has arrived! It features two designs from my family—my 9-year-old son with his 8-bit counter, and me with my RISC-V KIANV RV32E SoC that can play music. **@tinytapeout**

TINY TAPEOUT 2

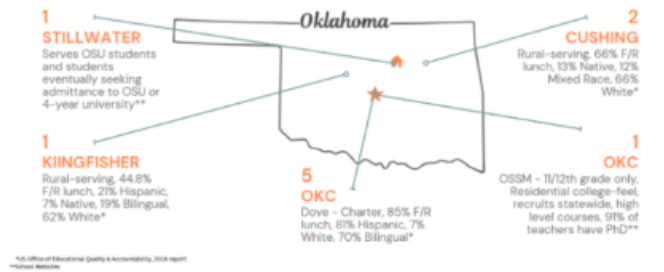
Project statistics

- 165 projects submitted. Each project is 150 x 170um
- Youngest submitter: 4 years old **4 year old**
- 64 used Wokwi graphical editor, 82 Verilog, 5 Amaranth,

NSF: RET Site: Chip Design Experiences for Teachers to Stimulate Semiconductor Education in Oklahoma (2023-2025)

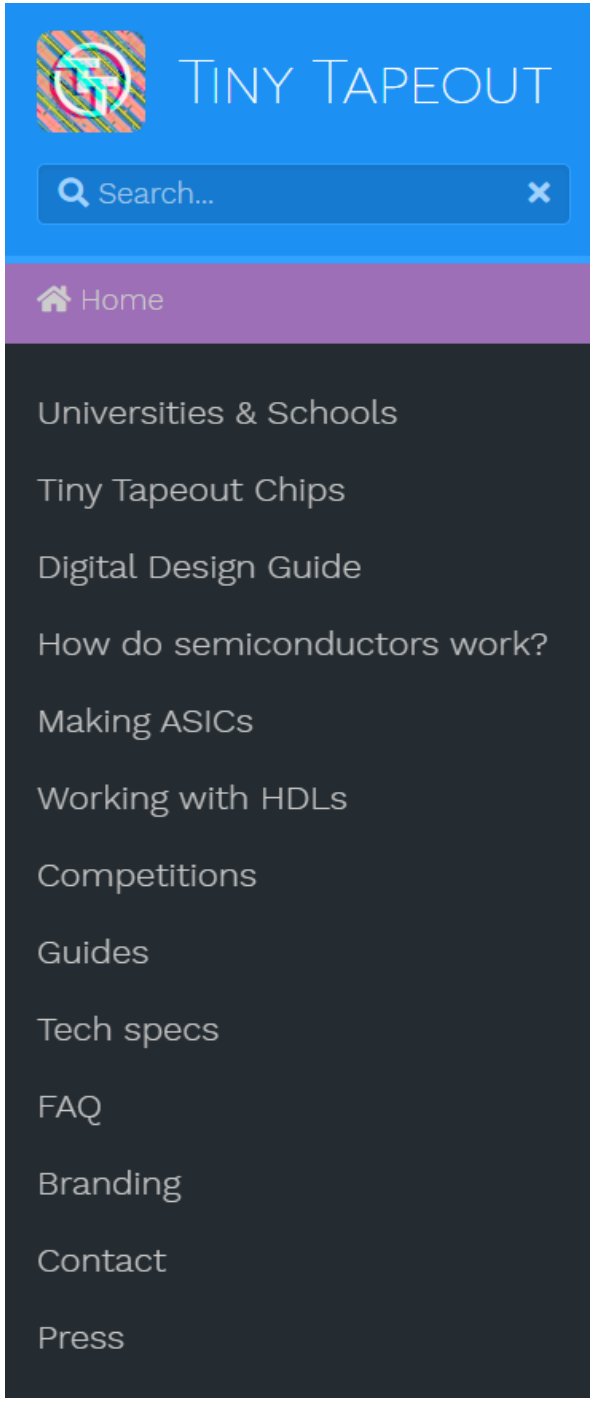
High School Teachers

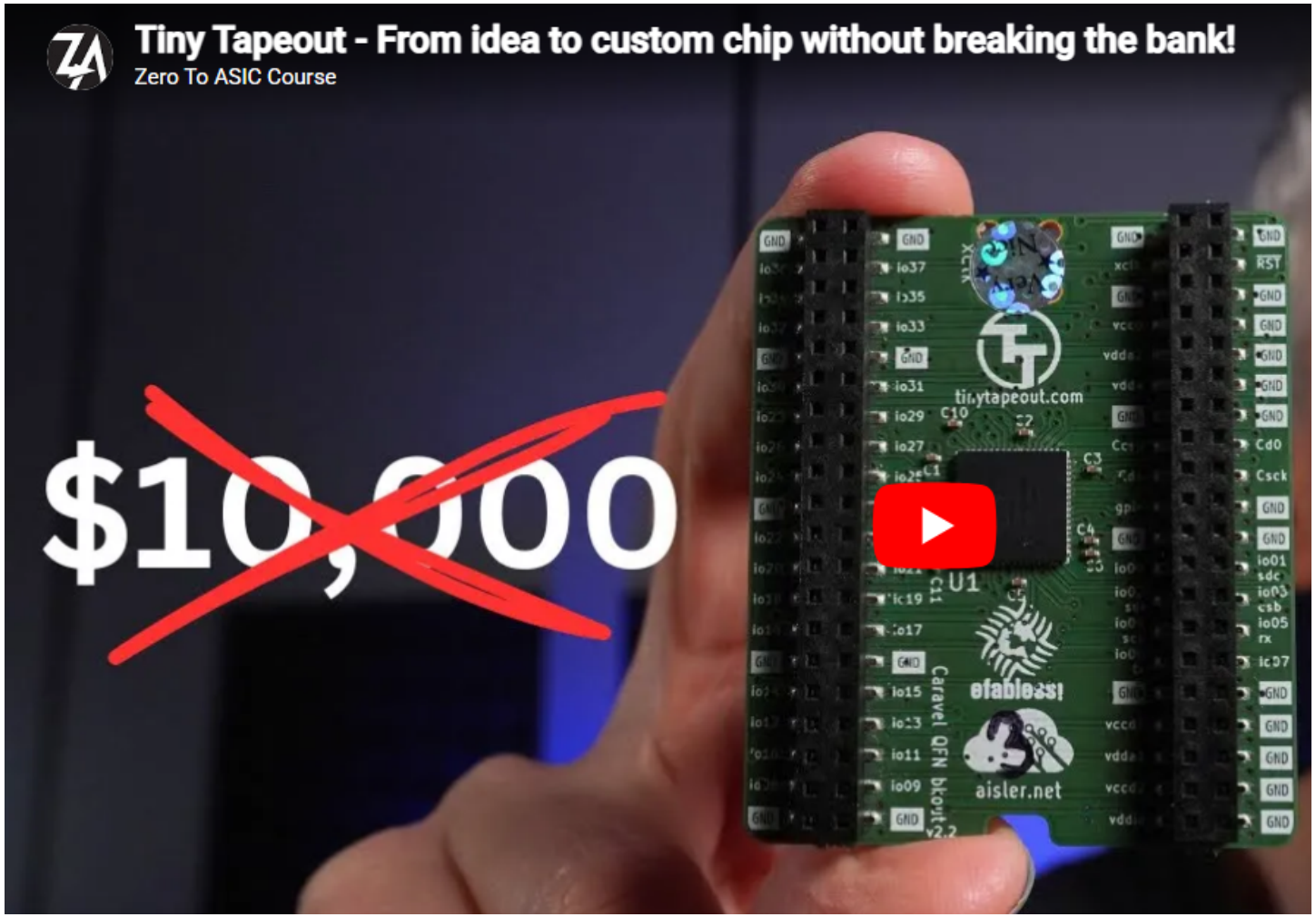
- This RET site at Oklahoma State University (OSU) will immerse Stillwater and Tulsa area high school and community college teachers in a six-week open-source, cyber-secure chip design experience.
- Teachers will also translate their research into much-needed and culturally relevant materials to teach semiconductors at their levels. OSU will leverage existing relationships to recruit teachers to the site while creating a state-wide semiconductor educational alliance.
- First Edition: June 12-30, 2023



Will also involve Matt Venn from Tiny Tapeout to help teach the masses!

https://tinytapeout.com/





GUIDES

- Getting started with the Tiny Tapeout 04+ demo board

Bring-up, manage, program and upgrade the demoboard

- Getting started with the Tiny Tapeout ETR demo board

Bring-up, manage, program and upgrade the demoboard

- Hardening Tiny Tapeout Projects Locally

Hardening your Tiny Tapeout projects with LibreLane, to speed up iteration times

- Interacting with projects and making measurements with the Analog Discovery

Using the Digilent Analog Discovery 3 to control and probe projects

- Updating your project documentation

Learn how to update your project documentation in the Tiny Tapeout shuttle repository

- FPGA ASIC simulator breakout

Test digital projects using the demoboard compatible FPGA

- Flashing the Gamepad PMOD

Guide on how to flash the firmware of the gamepad PMOD

- Submitting a Verilog project instead of Wokwi

Change your submitted project from Wokwi to Verilog.

- Workshop

Lessons for the Tiny Tapeout Workshop

- Advanced Workshop

Advanced lessons for the Tiny Tapeout Workshop

HOW DO SEMICONDUCTORS WORK?

https://tinytapeout.com/siliwiz/

- Introduction to SiliWiz

How SiliWiz helps you get an understanding of how semiconductors work and are manufactured

- Draw a Resistor

Learn the basics of SiliWiz while creating a component

- Parasitics

How we get unwanted parasitics in circuits and what that means

- Voltage Divider

Divide a number with 2 resistors

- Draw a capacitor

Understand how capacitance changes and using DRC to check your design

- Draw an N MOSFET

Active components: draw a MOSFET and make measurements

- Making a logic inverter

Create a logic gate and discover its shortcomings

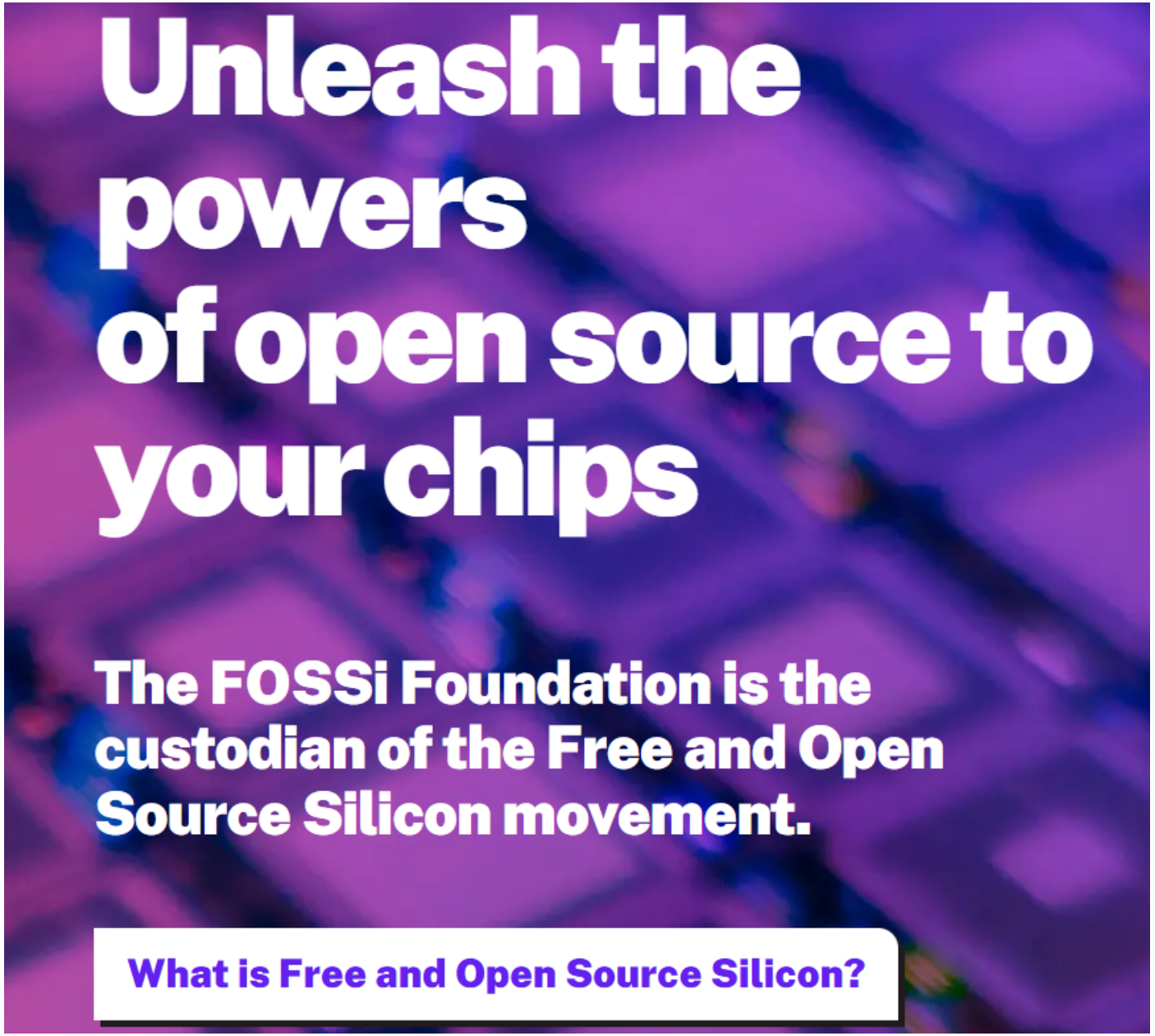
- Draw a P type MOSFET

Learn about the N type MOSFET's complement, the P type MOSFET

- Draw a CMOS inverter

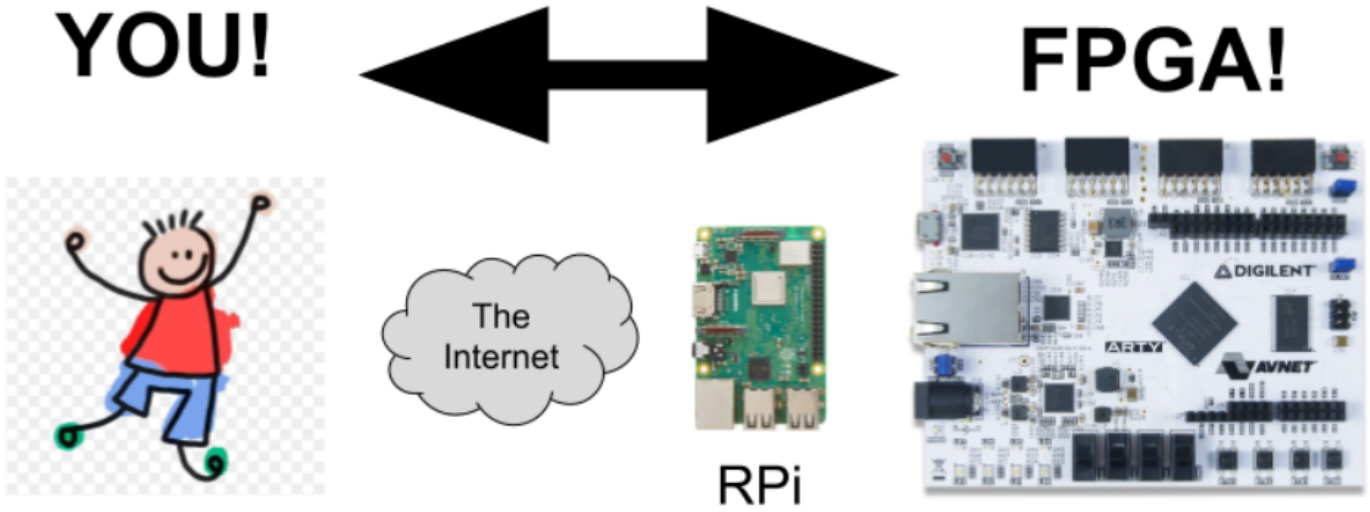
Understand the benefit of CMOS and explore standard cells

https://fossi-foundation.org/

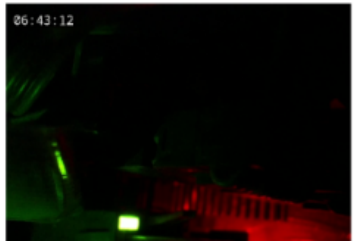


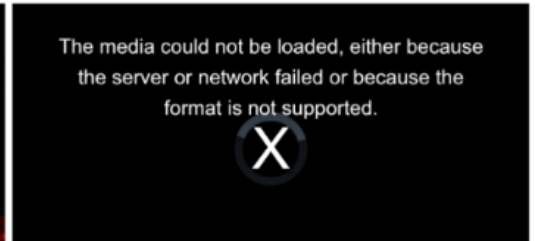
https://ps1.fpgas.online/fpgas/

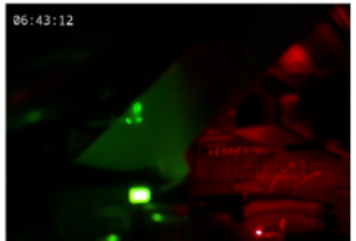
fpgas.online

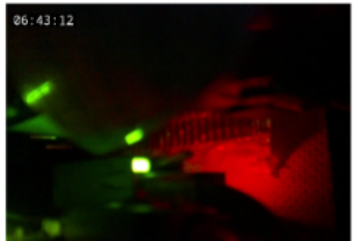


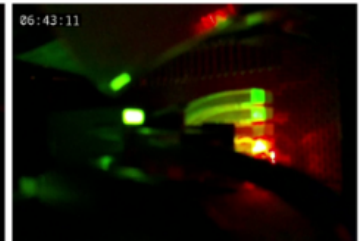
FPGA pi2	FPGA pi3	FPGA pi5	FPGA pi7	FPGA pi9	FPGA pi11
Use this FPGA	Use this FPGA	Use this FPGA	Use this FPGA	Use this FPGA	Use this FPGA

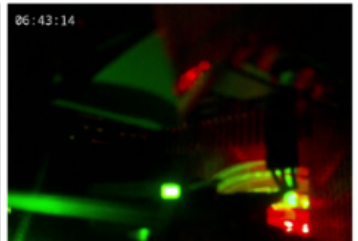












https://workshop.fomu.im/en/latest/

https://docs.google.com/presentation/d/e/2PACX-1vTS0lbAE_MwKedYGZtOuDhNeqGTjyusWtNFIHEtxZDRfiyJ3_dYpuWihOazWapcCcLUS-qa6VhKWHD5/pub?start=true&loop=false&delayms=3000&pli=1&slide=id.g4c390927567578f6_747

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Prof Sai Sundarakrishna, Chief Innovation Officer, School of AI has an Ivy league masters (Columbia Univ.), Virginia Tech masters and 20+ years of startup / corporate experience as an AI leader, building AI-ML products in Automotive, Internet commerce, Ed-tech &Healthcare. As a winner of inventor milestone awards (GM and caterpillar), Guest Editor of Intl J of Product Development, J N Tata scholar, his focus spans Linear Algebra, Optimization, Math models, Multi-omics and Generative AI.

Some Novelties in this Book:

This book unleashes the true power of pseudo inverse in the Machine Learning solution process. It offers a new way to initiate readers into the world of AI and ML, through a combination of first principles driven algebraic expressions, vector spaces and cognito-visual insights.

This book derives pseudo inverse as a function of left inverse and right inverse. In this process, it makes it obvious on how pseudo inverse ensures a least squares, least norm solution. This is a swift, seamless foray into ML solution process, which, can nicely be corroborated with manifold leaning, projection and SVD.

From fundamental Vector spaces and matrix subspaces, we seamlessly transition all the way into kernel methods mostly by first principles. By expressing the solution of axiomatic simultaneous linear equations to be in row space, kernel formation is shown. Explicit kernel mapping to high dimensions is evident.

This book unravels the multiple solutions for the left inverse and right inverse, using a combination of subspace solutions on top of an over determined system, while explaining the popular Frobenius norm optimizing least squares solution.

A simple way of deriving the basis of row space, column space, the left and right null spaces of a matrix using CR decomposition, RREF is provided

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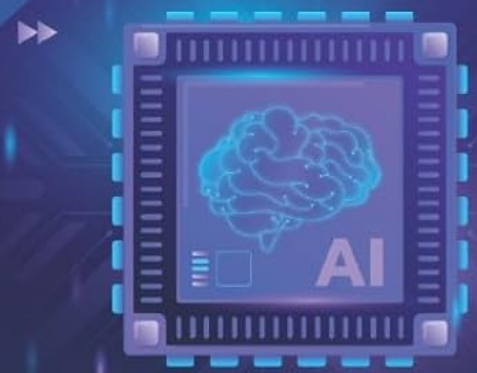


Foundations of Multidisciplinary AI

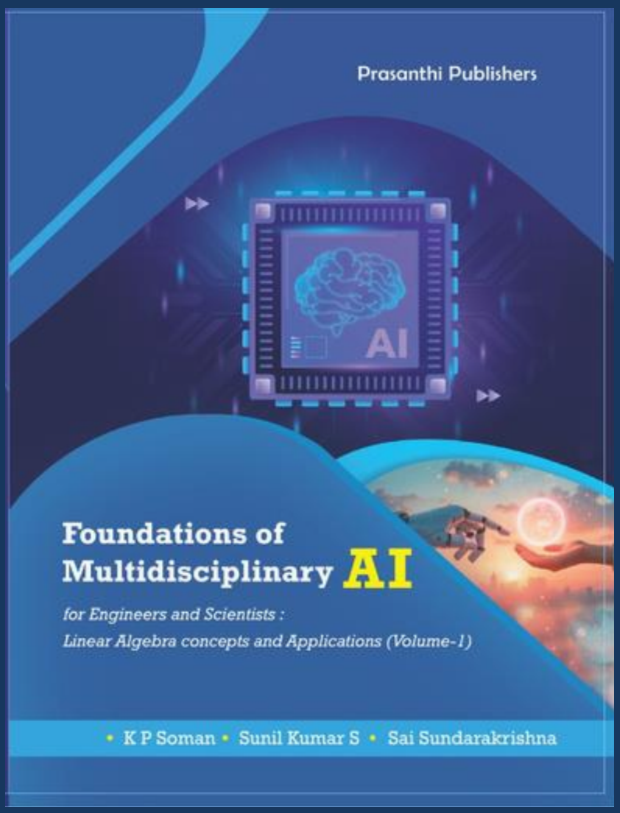
for Engineers and Scientists :

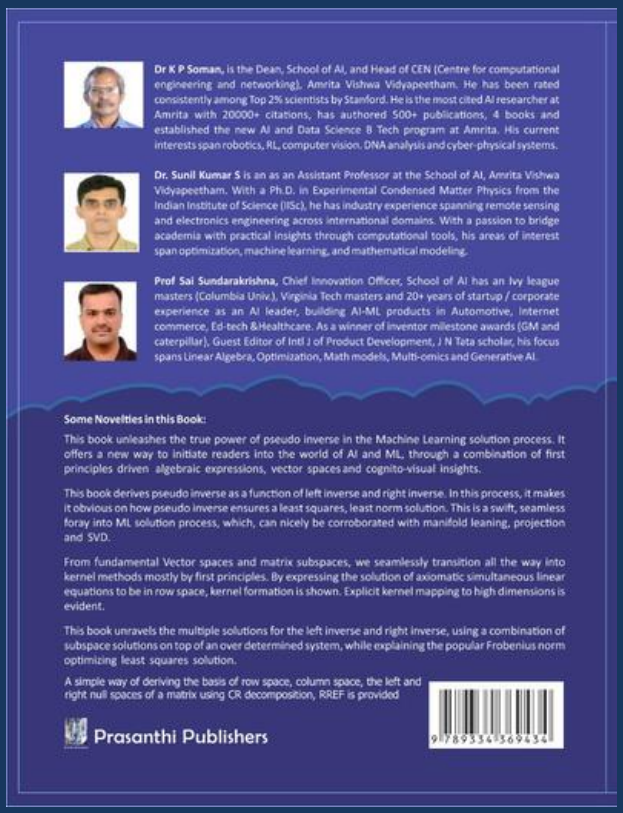
Linear Algebra concepts and Applications (Volume-1)

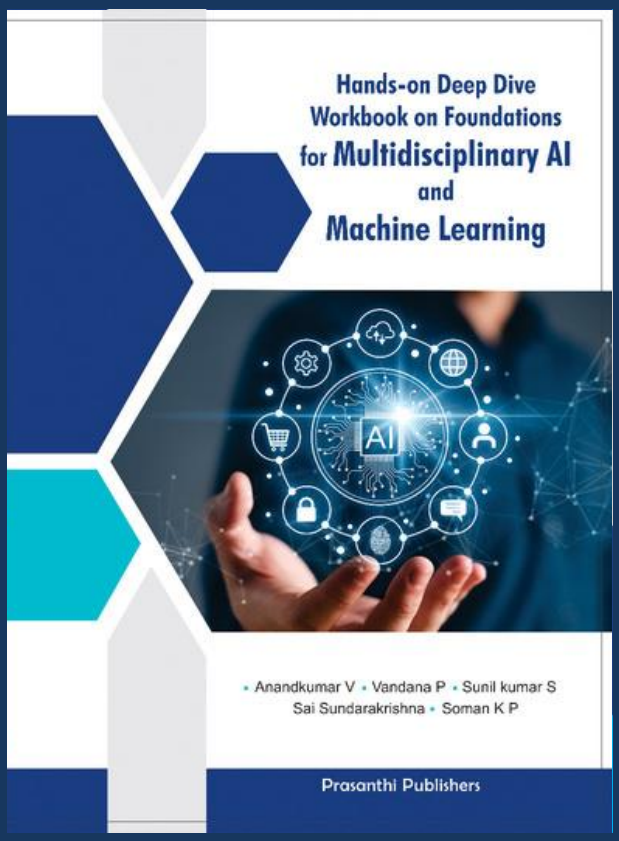
• K P Soman • Sunil Kumar S • Sai Sundarakrishna

In a Week : Deep AI Foundations and applications

From basic vectors to advanced kernel methods
to Gradient free Neural network architectures
through CR decomposition, Projection and Pseudoinverse







Deriving pseudo-inverse by hand, using only basic operations (transpose, inverse, multiplication)

Regression and classification using pseudo-inverse, stepwise. Within the first 4 hours a beginner solves the most important ML applications of classification and regression.

Conceptual numerical checks and verifications, reinforcing concepts such as rank, orthogonality and nature of 4 fundamental subspaces of matrix.

Opens up innovative ways to examine conceptual clarity across multiple topics such as CR decomposition, projection, eigenvalue, eigenvectors, matrix subspaces etc.

In a Quarter: Optimization, Signal Processing and Controls from a multidisciplinary field view for Scientists, Engineers, Doctors and Life science Researchers

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Dr. Neethu Mohan, serves as Assistant Professor (Sr.Gr.), School of AI, Amrita Vishwa Vidyapeetham. With a Ph.D in the area of data-driven techniques for power system analysis, she focusses on power quality monitoring, data driven analysis, AI and biomedical data analytics. She has authored 50+publications listed in Scopus and has an h-index of 11. She has edited a Springer book titled 'Artificial Intelligence for Materials Informatics'

Dr. Sachin Kumar S serves as Assistant Professor (Sr. Gr.), School of AI, Amrita Vishwa Vidyapeetham. He has a PhD in Natural LanguageProcessing and extensive experience in data science-related problems. His research interests are in AI and data science related problems and applications.With an h-index of 18, he has authored 100+ publications listed in Scopus and has edited a Springer book titled 'Artificial Intelligence for Materials Informatics'.

Some Novelties in this book:

This book bridges linear Algebra and optimization by posing least squares and least norm working of Pseudo inverse as an optimization problem and relates lagrangian multipliers with linear combination coefficients obtained during the Pseudo inverse process

Pioneers in simplifying and introducing topics such as Interior point method, Alternating Direction Method of Multipliers (ADMM), key formulations & applications of ADMM, Conjugate Gradient (CG) method for undergraduate level engineering and science applications.

This book shows the possibility of multiple least-squares solutions while performing Pseudo inverse and the ways to generate and verify such solutions using matrix subspaces principles

Derivation of Pseudo inverse using optimization

Derivation of projection matrix using CR decomposition and lagrangian formulation

A simple optimization formulation for highly accurate filtering during signal processing is shown

This book ventures into the fundamental aspects of optimization that is applicable across multiple fields of science and engineering, with a formulation-application-computation loop. At a pedagogy level, it principally opens up the formulation perspectives, details solution steps to frame the formulation to an iterative method needed for deep algorithmic problem solving.

Through vivid examples and insights, the book transitions from school level calculus to Taylor series, Level set, Partial derivatives, Lagrangian formulation and multipliers, Augmented Lagrangian and Proximal Gradients, constructing a smooth runway to advanced algorithms.

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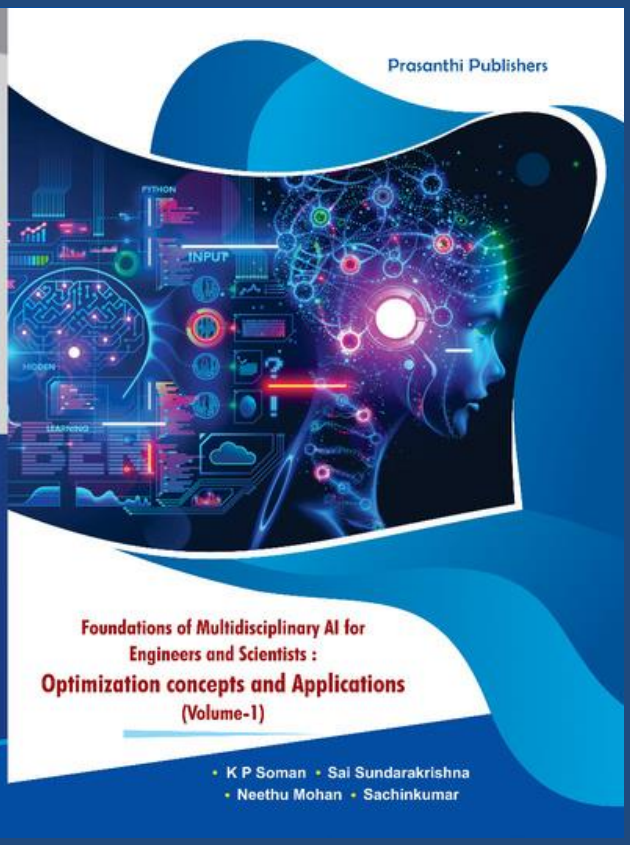

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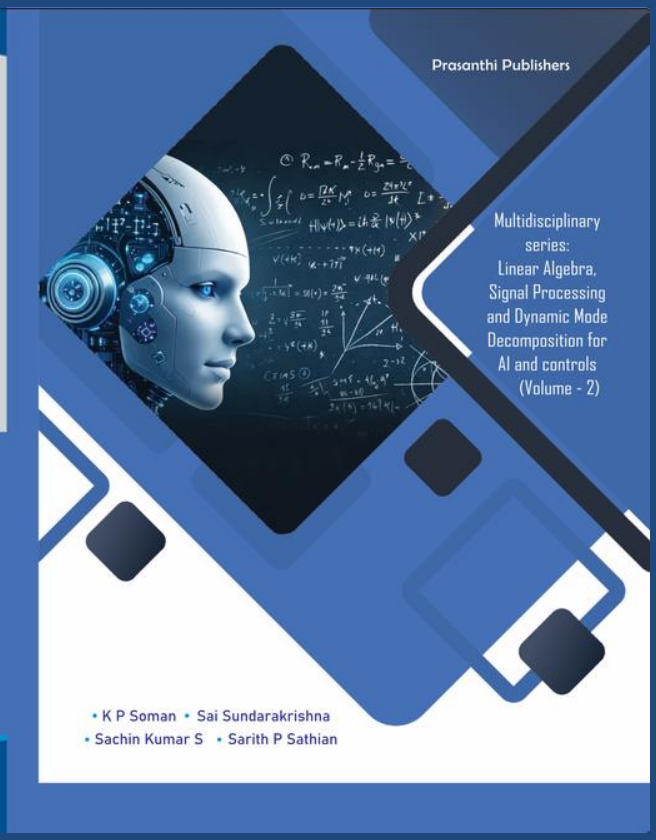
Synopsis and Novelties in this Book:

This book, second in the multidisciplinary series of Linear Algebra based Multidisciplinary AI, is aimed at providing an in depth application viewpoint with deep linear algebra. Certain application areas that are covered include signal processing, gradient free network learning and optimal controls. These areas have multidisciplinary consequences and are paramount to applied critical thinking and systems thinking.

The book provides a deep introduction to projection and pseudo inverse based learning. Through these concepts, the visualization/interpretation of en mass data training (gradient flow free), and learning is explained in algorithmic steps. These methods are cutting edge and are current areas of active research.

Signal processing, starts from Fourier, expands to time frequency localization capable wavelets and culminates with powerful signal representation methods like wavelet scattering transforms, thereby providing a comprehensive signal processing, analysis & representation for multidisciplinary applications

Linear (Dynamic Mode Decomposition) and Non-linear (Koopman operator theory) controls are dealt with through the concepts of observability, reachability / controllability from a linear algebra perspective. This would deeply inspire and orient the students to set their paths into the different design and control aspects under Science, Engineering, Medicine, Law, Commerce, DeepTech and Agriculture making them ready for solving real world problems.

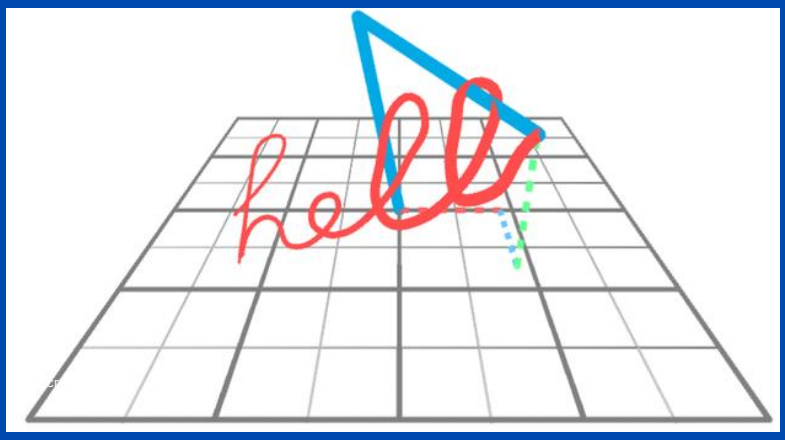


State of the art ADMM, Signal Processing from time frequency localisation to signal representation for ML, Data driven Linear and Nonlinear Controls as prime data science skills for governing process identification and system design

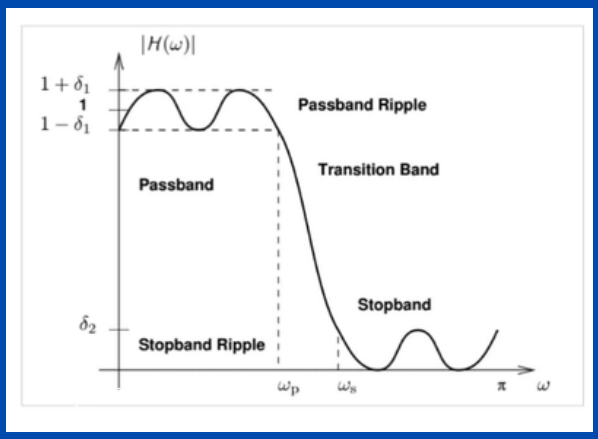
In a Year: Multidisciplinary Innovative Capstone

Define Inter-Disciplinary Innovation, Identify and Align the Deep Tech quotient, Domain Adaptation, Novel Solution with AI expertise

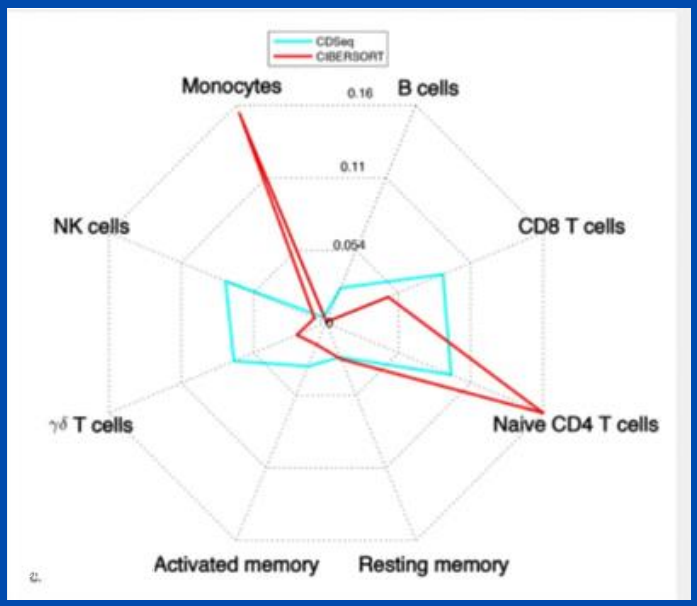
Inverse kinematics



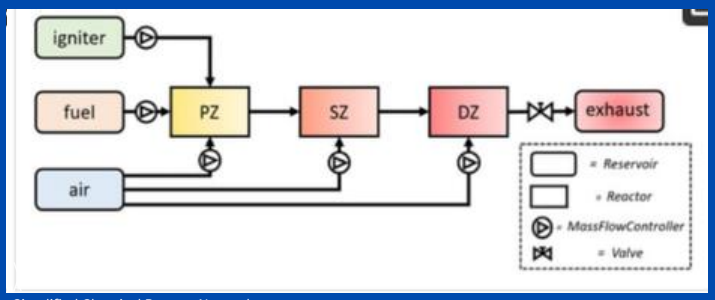
Filter Design



Cell Type Deconvolution



Chemical reactor Network flow rate Modeling and Management



Simplified Chemical Reactor Network

Biennial Score Card : Externship, Enterpreneur-in-Residence with industry, Patent / Societal / Academic Value

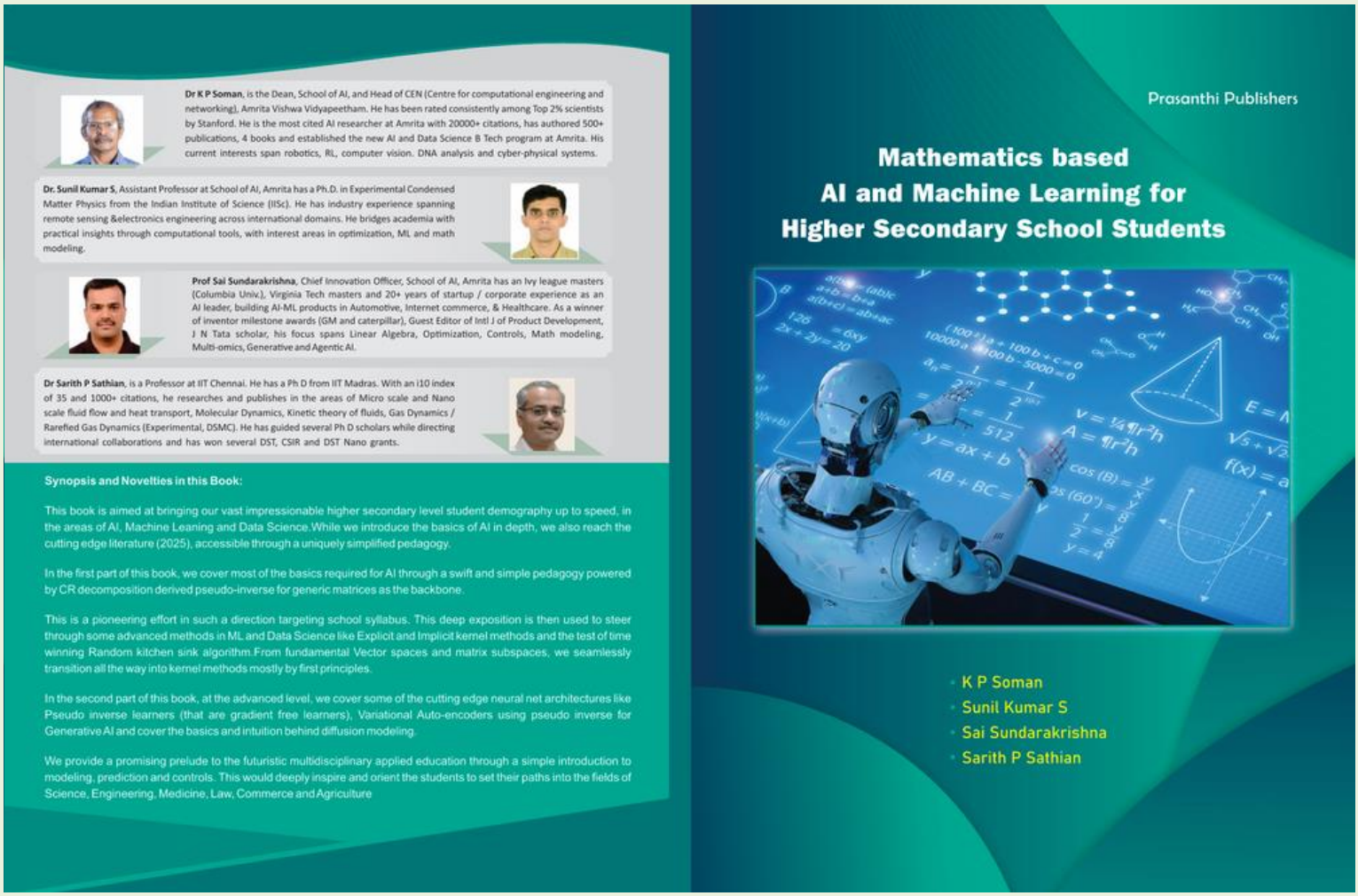
How to Design the Future of Bharat

Groom the Talent Early and Deep, Start from schools

New Pedagogy adaptive to hands-on computational enablement

Computational Enablement ensures deeper observational / modeling skills, visualization skills and scalability (high-Dimensional thinking) by design

Most of ML and Robotics can be covered before +2 through this pedagogy



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Synopsis and Novelties in this Book:

This book is aimed at bringing our vast impressionable higher secondary level student demography up to speed, in the areas of AI, Machine Leaning and Data Science.While we introduce the basics of AI in depth, we also reach the cutting edge literature (2025), accessible through a uniquely simplified pedagogy.

In the first part of this book, we cover most of the basics required for AI through a swift and simple pedagogy powered by CR decomposition derived pseudo-inverse for generic matrices as the backbone.

This is a pioneering effort in such a direction targeting school syllabus. This deep exposition is then used to steer through some advanced methods in ML and Data Science like Explicit and Implicit kernel methods and the test of time winning Random kitchen sink algorithm.From fundamental Vector spaces and matrix subspaces, we seamlessly transition all the way into kernel methods mostly by first principles.

In the second part of this book, at the advanced level, we cover some of the cutting edge neural net architectures like Pseudo inverse learners (that are gradient free learners), Variational Auto-encoders using pseudo inverse for Generative AI and cover the basics and intuition behind diffusion modeling.

We provide a promising prelude to the futuristic multidisciplinary applied education through a simple introduction to modeling, prediction and controls. This would deeply inspire and orient the students to set their paths into the fields of Science, Engineering, Medicine, Law, Commerce and Agriculture

Prasanthi Publishers

Mathematics based AI and Machine Learning for Higher Secondary School Students

- K P Soman
- Sunil Kumar S
- Sai Sundarakrishna
- Sarith P Sathian

Our LeapFrogging in Pedagogy

Tangible blueprint for our ``55 crore demography under the age of 23

Modular Multidisciplinary Microcredentials

M1: Vector spaces to Eigenspaces
M2: From CR Decomposition, Projection to PseudoInverse
M3. Singular Value Decomposition (SVD), Multioutput Regression, Spectral Clustering
M4: Linear Algebra and Unconstrained Optimization
M5: Constrained Optimization with Linear Algebra and ADMM
M6. Nonlinear Regression and Neural Networks for Classification
M7. Random Kitchen Sink, Gaussian Process Regression and Applications
M8. Neural Tangent Kernel and Applications
M9. PseudoInverse learning based Generative AI and Diffusion
M10. Linear Algebra, ODE and Control Systems combination
M11. FFT, Convolution and CNN
M12. Linear Algebra, Robotics and AI
M13. Optimization and Kalman Filter for Control applications
M14. Modern Algebra, Cryptography and Cybersecurity
M15. Linear Algebra and Quantum Algorithms, Quantum Machine Learning
M16. 2D DCT, Huffman Coding, Data Compression and Steganography
M17. Variational Mode Decomposition, Dynamic Mode Decomposition
M18. Koopman Operator Theory and Applications for Data Science
M19. AI for Multiomics and Spatial Biology.
M20. AI in Ayurvedic Studies for Precision and Personalized Medicine
M21. Linear Algebra and Optimization for Large Language Models
M22: Generative AI and Agentic AI Patterns

Transformation through Faithful Implementation of NEP (In every spirit of the word and beyond)

Project based Learning

Evalify: Use of AI in Assessment, Continual Learning, Personalized feedback

Open book

Microcredentias by expert Researchers, Academics, Industry professionals

Professors of Practise

<u>All this led Amrita School of AI to become:</u>

Grand Winners at Hack Harvard 2024

Google Hackathon 2025 (Guinness Record Event): Best Breakthrough Idea

Medal Winning Entry at Re-Invent, Dec 2025

Several National Hackathon Wins (Web3Conf, Gender xAI)

Several Corporate Hackathon Wins (SpinSci, Myntra)