

Intelligent Design Paradigm

MSV International Engineering Fair

10.-13. 10. 2023

Brno Exhibition Centre, Brno, Czech Republic

Aerospace Moonshots



AIoT/ESG:

- Smart City
- Smart Building
- Smart Manufacturing



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Mechanical Engineering

Materials Science



powered by Platograph



PLATOGRAPH



Quantinar + Quantlet

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The 3rd Yushan Conference & The 17th NYCU International Finance Conference
12/08/2023

* IDP representing Taiwanese precision manufacturers to participate in MSV International Engineering Fair, Brno, Czech Republic, 2023

AIoT/ESG : Smart City / Smart Building & Home / Smart Manufacturing

TAIWAN

Some notes before we begin the presentation:

- (1) Many thanks to Prof Wolfgang Karl Härdle and NYCU for inviting me to share our experiences as a precision manufacturer to take on the challenges of the AI transformation amid the current wave of industrial revolution.
- (2) This session was originally intended for Dr Jenher Jeng, the inventor of Platograph system and one of the sponsors for this conference, to present “Tokenomics of Personalized Knowledge Base”. Unfortunately, he has lost his capability for vocal communication after his trip to Europe for attending a machine learning conference in Prague and the engineering fair in Brno. We hope he can recover from his illness soon to share his ideas and innovations on this topic.
- (3) Although my talk’s title seems distant from Dr Jeng’s intended talk’s title, as a matter of fact, they are quite deeply related if you think a bit more about how the economy works from employees to enterprises to networks of supply chains to end-products to consumers. you’ll find the idea of “digital twin” very interesting, and you might agree with me about the vision that the perception of “digital twin” and the value of intangible asset on the blockchain must dominate the future of digital economy – please see the BBC article: [Why you may have a thinking digital twin within a decade](#). I believe that, combining Platograph and the Q2 system, we can train more and more talents to cooperate with AIs so that our precision manufacturing knowhow can be copied from our human brains into machines **token by token** on blockchain – that is, weaving knowledge to assemble the digital brain **edge by edge** in advanced graph techniques based on the architecture of intelligence (Aol), according to Dr Jeng’s thoughts about AGI.

To fill in the formidable “gap” of transforming from a conventional manufacturer to a smart factory, here are the three steps for us to build our company’s “digital brain” (Aol knowledge-base) on Platograph+Q2:

I. **One Graph** – we build a graph to link our products. After all, a company is best represented by all its products in a big picture.

II. **One Array** – we train our employees and interns to learn from Coursera (fundamentally) and Quantinar (advancedly) and assemble what they co-learned from problem-solving skills to industrial/economic development trends, and even entrepreneurship mindsets in **MMX** formation of knowledge modules to be stored and connected on Platograph, later also demonstrated by my son Bruce for IDP’s Moonshot project.

III. **One Path** – we try to solve problems (designing or refining) in the SOP of **ARCH** 20 Steps (Adaptivity, Robustness, Consistency & Humanity) based on the Architecture of Intelligence (**Aol**) to connect the dots of idea, knowledge, experience, creation and wisdom. After all, ESG is not a buzzword to make money, but a responsibility and passion to innovate for making the world better against the threats of climate change. Hope, in the future, we’ll have a tale to tell like Linde’s story from ice-making for brewery to thermodynamics to refrigerator to helium liquefaction for inspiring the discovery of superconductivity by Onnes.

IDP's Product Graph in One Graph

The screenshot displays the PLATOGRAPH software interface. On the left, a network graph shows numerous nodes (purple and red) connected by lines, representing a complex product structure. The interface includes a search bar at the top left, user information (Islam ARCH, 48178), and a search filter (V1). Below the graph, there are buttons for 'CLEAR', 'PUZZLE', and 'BLOOM', along with a 'Path Length: 55' indicator and a 'Path-D' dropdown menu. A descriptive text block reads: 'Precision Right Angle Gearbox Solutions for Efficient Mechanism Designs'. At the bottom left, the text 'Domino: 149 KM: 0 HN: 57' is visible. On the right side, a large grid of 78 small images shows various mechanical components, including gears, shafts, and housings, each with a red 'x' icon in the bottom right corner. The top right corner features a 'CLEAR' button and a search filter (V1).

The AI-bot Pathon's Assembly of Product Portfolio

The screenshot displays the PLATOGRAPH software interface. On the left, a network graph shows a complex web of nodes and connections. The top navigation bar includes a search field, user information (Istemma ARCH, 48178), and project details (V1, DOMINO, KM, HN). The bottom left features buttons for 'CLEAR', 'PUZZLE', and 'BLOOM', along with a 'Path Length: 10' slider and a 'Date Range' selector. The bottom right shows a grid of 14 motor components, with the top-left one highlighted in yellow. The text 'Precision Right Angle Gearbox Solutions for Efficient Mechanism Designs' is visible at the bottom left of the interface.

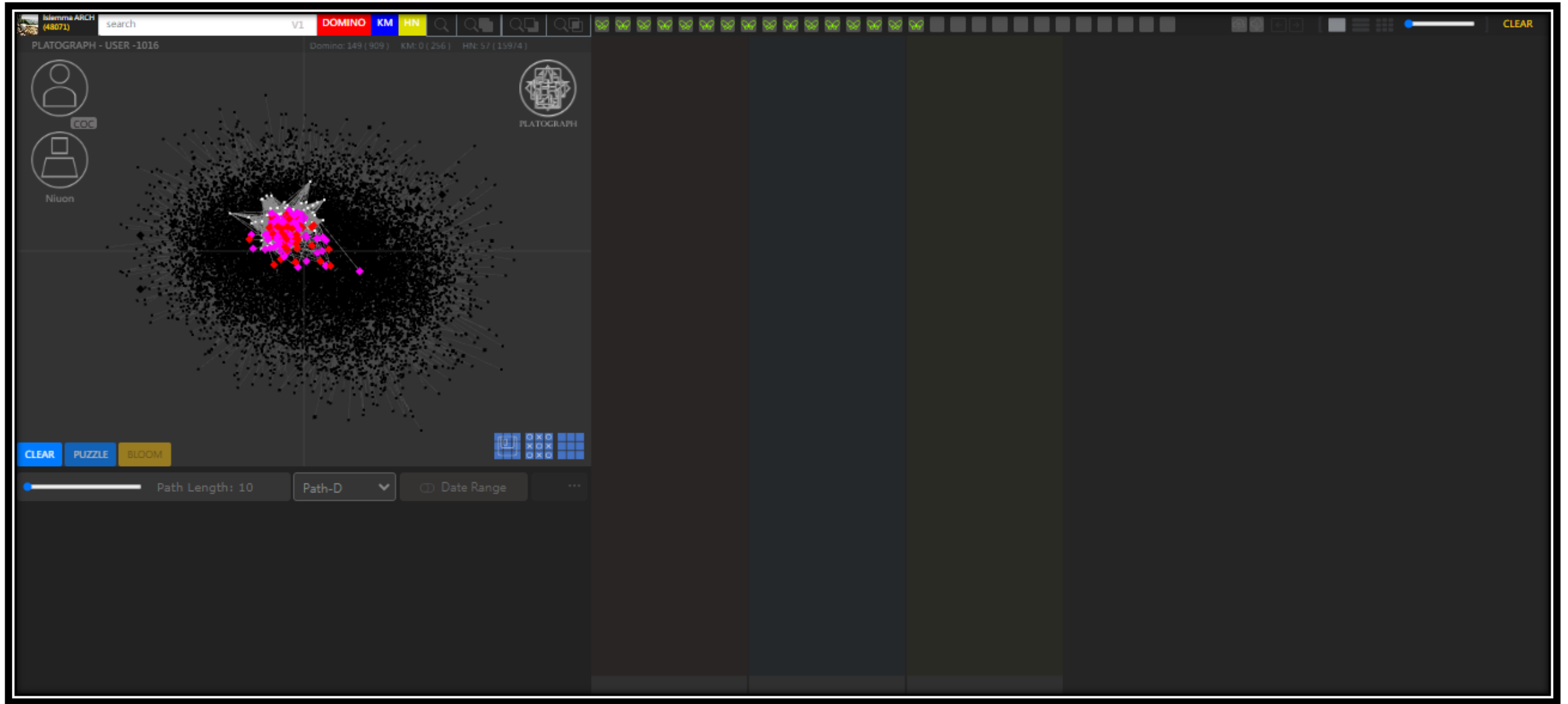
Linking to the AI-Bot **Niuon** (a Polymath Bot)

The screenshot displays the PLATOGRAPH software interface. At the top, the user is identified as 'Istemma ARCH (48178)' with a search bar and navigation icons. The interface is divided into several sections:

- Left Panel:** Contains a user profile icon, a 'Niuon' icon highlighted with a green box, and a large network graph with numerous nodes and connections.
- Top Bar:** Shows 'V1' and three colored tabs: 'DOMINO' (red), 'KM' (blue), and 'HN' (yellow). A 'CLEAR' button is on the far right.
- Right Panel:** A grid of 14 motor component images. The top-left image is highlighted with a yellow border. Below the grid are navigation icons.
- Bottom Panel:** Includes buttons for 'CLEAR', 'PUZZLE', and 'BLOOM'. Below these are controls for 'Path Length: 10', 'Path-D', and 'Date Range'. A status bar at the bottom shows 'Domino: 0', 'KM: 0', and 'HN: 11'.

Precision Right Angle Gearbox Solutions for Efficient Mechanism Designs

Connecting the Product Graph to the Nuion's "Digital Brain"



Finding a Product of Interest

The screenshot displays the PLATOGRAPH software interface. At the top, a search bar contains the text "angle gearbox". Below the search bar, the interface is divided into several sections:

- Left Panel:** Contains a search history or filter area with "+angle" and "+gearbox" buttons. Below this are icons for user profiles and a "Niuron" label.
- Central Area:** A large, dark, circular cluster of small, interconnected nodes representing search results or a network graph.
- Right Panel:** A vertical list of three product images. The top two images show a black gearbox component from different angles. The bottom image is a grid of various gearbox models from different manufacturers.
- Bottom Panel:** Includes a "CLEAR" button, a "PUZZLE" button, and a "BLOOM" button. Below these are controls for "Path Length: 10", "Path-D", and "Date Range".

At the bottom of the interface, there are status indicators for "Domino: 0", "KM: 0", and "HN: 3".

One of IDP's Proudest Products about the Size of a Fingertip



Niun & Pathon recommending Related Knowledge

The screenshot displays the PLATOGRAPH software interface. On the left, a knowledge graph is visible with nodes and edges. The top navigation bar includes the user name 'Islam ARCH (48071)', the search term 'angle gearbox', and various tool icons. Below the graph, there are buttons for '+angle' and '+gearbox'. A list of news items is shown on the left side. At the bottom left, there are buttons for 'CLEAR', 'PUZZLE', and 'BLOOM', along with a 'Path Length: 55' indicator and a 'Date Range' filter. The main area on the right is a grid of 50 recommended related knowledge items, each represented by a small thumbnail image. The bottom right corner shows the statistics 'Domino: 0', 'KM: 0', and 'HN: 56'.

Machine learning based nominal root stress calculation model for gears with a progressive curved path of contact | ScienceDirect

Human assembling MMX* from AI's Knowledge Puzzle

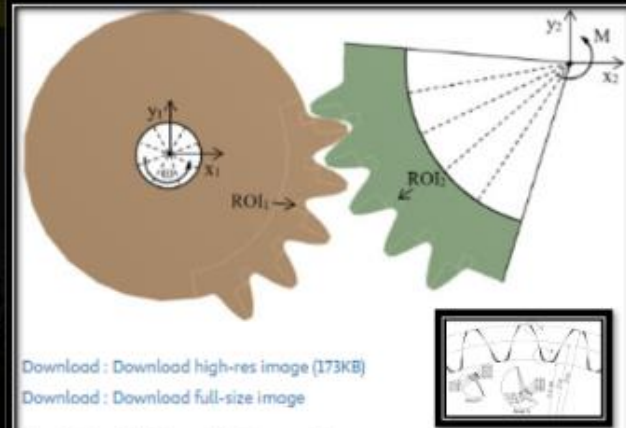
The screenshot displays the PLATOGRAPH software interface. At the top, the user is identified as 'Istemma ARCH (48071)' with a search bar containing 'arch sop'. The interface includes a navigation bar with 'V2', 'DOMINO', 'KM', and 'HN' tabs. The main workspace is a dark grid with a central cluster of points and a small star-shaped icon. On the right, a vertical column of nine puzzle pieces is shown, each with a red 'X' in the top right corner and a set of control icons at the bottom. The pieces contain various content: a network diagram, a mechanical part, a document page, a colorful abstract image, a technical drawing, a document page, a document page, a document page, and a document page. At the bottom left, there are buttons for 'CLEAR', 'PUZZLE', and 'BLOOM', along with a 'Path Length: 55' indicator and a 'Path-D' dropdown menu. The bottom right corner shows 'Domino: 3', 'KM: 3', and 'HN: 3'.

* MMX : MindMatrix – Knowledge Module

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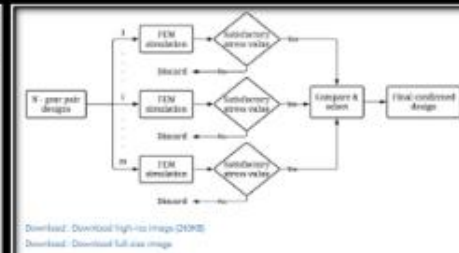
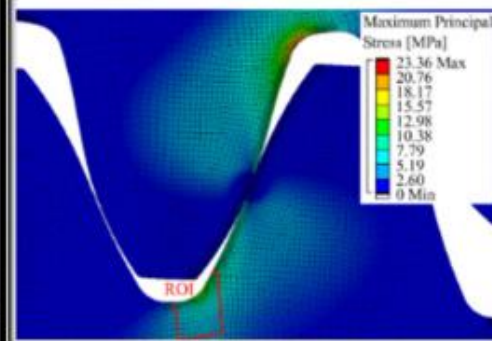
 IDP CO., LTD.

Machine Learning for Designing Gears in FEM Simulation



Download : Download high-res image (173KB)
Download : Download full-size image

Fig. 3. The FEM model of a meshing gear pair.



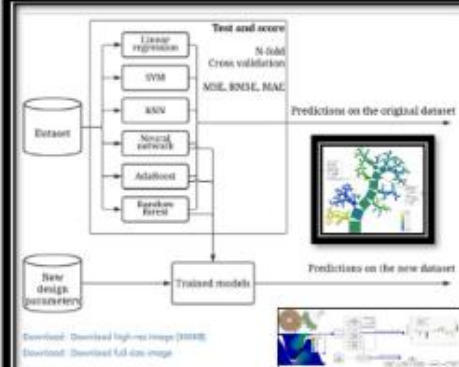
Download : Download high-res image (204K)
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Fig. 10. Workflow of the traditional method.



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Download : Download full-size image

Fig. 11. Workflow of using the new system decision model.



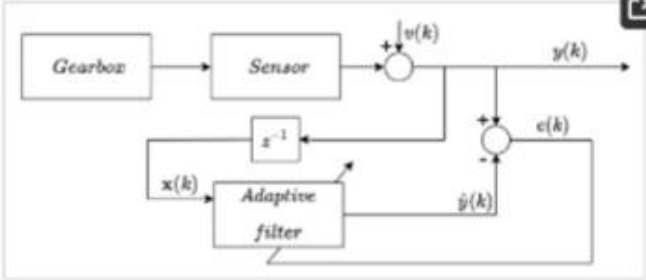
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Fig. 6. Workflow of training and using the model.

Machine learning based nominal root stress calculation model for gears with a progressive curved path of contact | ScienceDirect

Machine Learning for Monitoring Gearbox in Fault Diagnosis

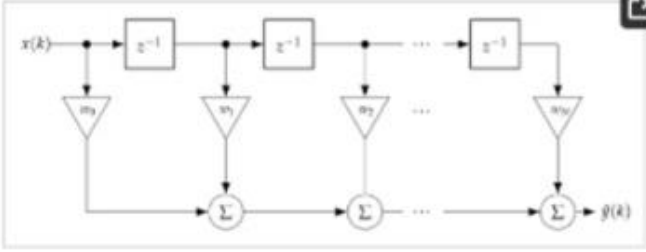
Note that the adaptive weights were updated via NLMS algorithm (Section 2.3) with every sample obtained.



The diagram shows a feedback loop for an adaptive filter. A 'Gearbox' block feeds into a 'Sensor' block. The output of the sensor is summed with a noise signal $v(k)$ to produce the observed signal $y(k)$. This signal $y(k)$ is fed into an 'Adaptive filter' block. The filter's output is $\hat{y}(k)$, which is subtracted from $y(k)$ to produce the error signal $e(k)$. The error signal $e(k)$ is fed back into the 'Adaptive filter' block. Additionally, the error signal $e(k)$ is passed through a unit delay block z^{-1} and fed back into the 'Sensor' block. The input to the filter is $x(k)$.

Figure 1. Block schema of adaptive filtration process.

The block schema of the filter is depicted in Figure 2. The block with z^{-1} represents unit time delay (consider Z-transform notation).



The diagram shows a digital adaptive filter structure. The input signal $x(k)$ is fed into a series of unit delay blocks z^{-1} . The output of each delay block is multiplied by a corresponding weight w_1, w_2, \dots, w_N . The weighted signals are then summed at each stage to produce the filter output $\hat{y}(k)$.

Figure 2. Block schema representation of a digital adaptive filter.

Entropy: A Machine Learning Approach for Gearbox System Fault Diagnosis

Architecture of Intelligence (Aoi) to build Digital Brain

The screenshot displays a web application interface for 'ARCHITECTURE OF INTELLIGENCE'. The main content area features a flowchart with the following components and connections:

- Top Row:** Databases → Algorithms → Strategies → Solutions
- Bottom Row:** Ideas/Problems → Factors → Models → Utilities/Goals
- Central Hub:** A Venn diagram with four overlapping circles: 'MATHEMATICS & STATISTICS' (red), 'MACHINE LEARNING' (blue), 'BUSINESS DOMAIN KNOWLEDGE' (green), and 'DATA SCIENCE' (yellow). The intersections are labeled 'ADVANCED ANALYTICS' and 'DATA ANALYTICS'. 'COMPUTER SCIENCE' is also indicated near the Machine Learning circle.
- Flow:** Arrows connect 'Databases' to 'Algorithms', 'Algorithms' to 'Strategies', 'Strategies' to 'Solutions', 'Solutions' to 'Utilities/Goals', 'Utilities/Goals' to 'Models', 'Models' to 'Factors', 'Factors' to 'Ideas/Problems', and 'Ideas/Problems' to 'Databases'. There are also bidirectional arrows between 'Databases' and 'Ideas/Problems', and between 'Algorithms' and 'Factors'.

Below the flowchart, a yellow text box states: **Knowledge-Base : Knowledge is Puzzle – there won't be much power until puzzles are solved !**

The interface includes a search bar at the top, a 'PLATOGRAPH' logo, and a 'ARCH-SOP-20-Steps' indicator. At the bottom, there is a navigation bar with 'PRV' and 'NEXT' buttons, and a row of thumbnail images.

ARCH SOP of Problem-solving based on Aol

ARCH SOP of 20 Steps for Problem-solving, Innovation-inspiring & Architecture of Intelligence :

- ❖ S.01 Defining a Problem
- ❖ S.02 Clarifying the Purpose (Decision-Making Risk/Return Tradeoff Protocol)
- ❖ S.03 Realizing the Situation
- ❖ S.04 Stratifying the Factors
- ❖ S.05 Collecting the Data
- ❖ S.06 Modeling the Problem (Knowledge Model for Data Analysis)
- ❖ S.07 Analyzing the Data
- ❖ S.08 Refining the Problem
- ❖ S.09 Combining other Problems (Incorporating More Interdisciplinary Factors)
- ❖ S.10 Constructing/Architecting the Knowledge-Base
- ❖ S.11 Constructing/Architecting the Database
- ❖ S.12 Collecting more Data
- ❖ S.13 Refining the Model
- ❖ S.14 Classifying some Scenarios
- ❖ S.15 Running feasible Simulations
- ❖ S.16 Shaping alternative Solutions
- ❖ S.17 Making contingent Decisions (Plan-A/B/C)
- ❖ S.18 Executing adaptive Orders
- ❖ S.19 Assessing unexpected Results
- ❖ S.20 Collecting more-related Data

A.I. machine-learning loops

Simulation Execution Monitoring Analysis

ARCH-SOP-20-Steps for Problem-Solving & Innovation

PRV

NEXT

Needs to learn Mechanical Engineering & Statistical Modeling

Fig. 3. The FEM model of a meshing gear pair.

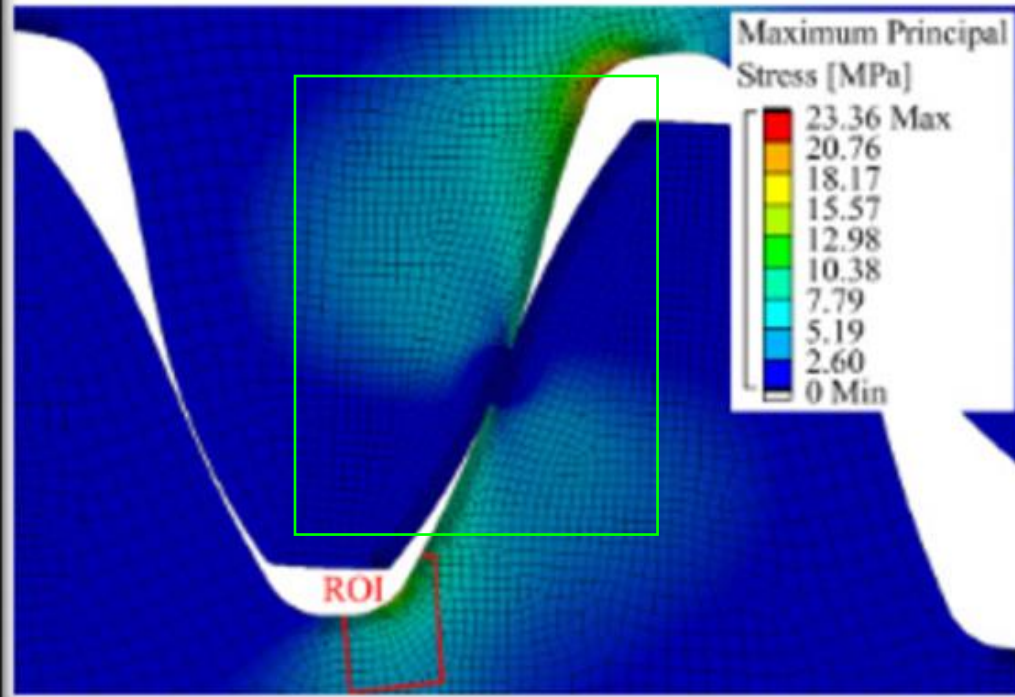


Fig. 11. Workflow of using the new support-decision model.

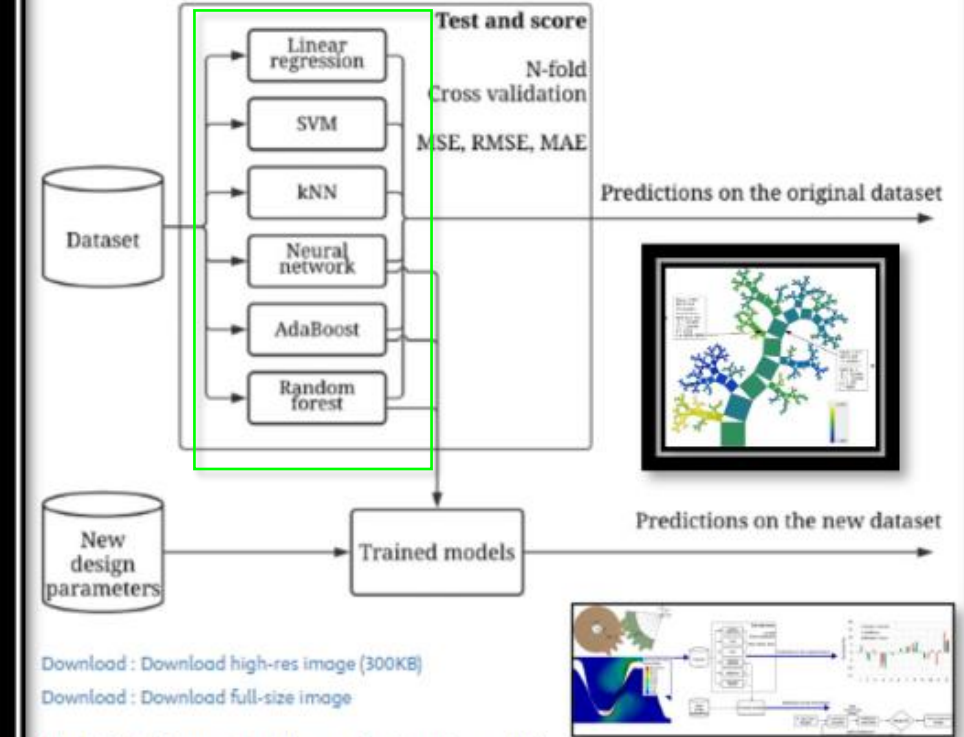


Fig. 6. Workflow of training and using the model.

ng based nominal root stress calculation model for gears with a progressive curved path of contact

All Courses of Coursera in One-Graph on Platograph



Only Six Courses containing Keyword “Mechanical”

The screenshot displays the PLATOGRAPH interface with the search term "mechanical" entered in the top search bar. The interface includes a navigation bar with "V1", "DOMINO", "KM", and "HN" tabs. A central visualization shows a network of nodes and connections. On the right, a grid of six course thumbnails is visible, each with a red 'X' icon in the bottom right corner. The thumbnails include: a person at a laptop, a person in a green shirt at a workstation, a person at a desk, a person at a computer, a person at a laptop, and a book cover titled "METALLURGY". Below the thumbnails are navigation icons. At the bottom of the interface, the text "Introduction to Mechanical Engineering Design and Manufacturing with Fusion 360" is displayed. The bottom status bar shows "Domino: 0", "KM: 0", and "HN: 6".

But Pathon can help Finding More Related Courses

The screenshot displays the PLATOGRAPH interface. On the left, a network graph shows a dense cluster of nodes connected by lines, representing relationships between courses. The graph is titled 'PLATOGRAPH - USER -1010'. Below the graph, there are controls for 'CLEAR', 'PUZZLE', and 'BLOOM', along with a 'Path Length: 55' indicator and a 'Path-D' dropdown menu. The main content area on the right is a grid of 60 course thumbnails, each with a red 'X' in the bottom right corner, indicating they are related to the selected course. The thumbnails include various educational topics such as 'C++', 'SDLC', 'Agile', 'Wix Website', and 'Product Design'. At the bottom left, the title of the selected course is visible: 'Introduction to Mechanical Engineering Design and Manufacturing with Fusion 360'. The interface also shows user information like 'Idemna ARCH (48071)' and 'mechanical' in the top left, and a 'CLEAR' button in the top right.

Bingo! Course to learn Applications of IDP's Tiny Angle Gearbox

The screenshot shows a course interface with a central video player. The video title is "ROBOTICS SPECIALIZATION Part II: Computational Motion Planning". The video content features a drone hovering above an open hand, with a green square highlighting a motor on the drone. The interface includes a sidebar with navigation icons, a top bar with user information, and a bottom bar with a progress indicator and a "NEXT" button. A grid of course thumbnails is visible on the right side.

ROBOTICS SPECIALIZATION
Part II: Computational Motion Planning

Robotics: Computational Motion Planning

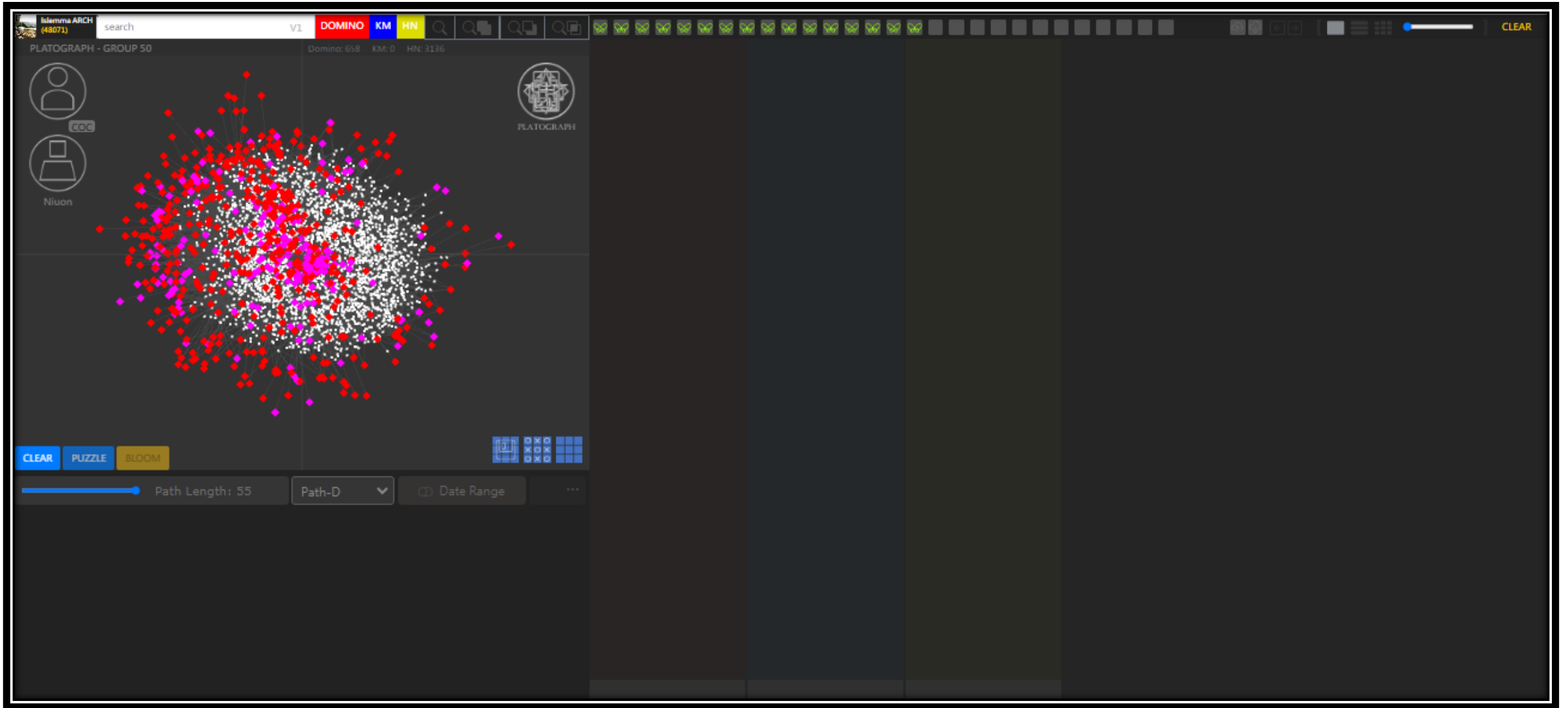
PRV

NEXT

Pathon finding Even More Related Courses in Node-Extension

The screenshot displays the PLATOGRAPH interface. On the left, a network graph shows a dense cluster of nodes and edges, with a search bar at the top containing the text 'mechanical'. Below the graph, there are buttons for 'CLEAR', 'PUZZLE', and 'BLOOM', and a 'Path Length: 55' indicator. The right side of the interface features a grid of course thumbnails, each with a small 'x' icon in the bottom right corner. The thumbnails are arranged in a grid that is approximately 6 rows by 10 columns. The top row includes thumbnails for 'AI', 'N', and 'AI'. The second row includes 'AI', 'N', 'AI', 'IBM', 'AI', and 'AI'. The third row includes 'AI', 'N', 'AI', 'AI', 'AI', and 'AI'. The fourth row includes 'AI', 'AI', 'AI', 'AI', 'AI', and 'AI'. The fifth row includes 'AI', 'AI', 'AI', 'AI', 'AI', and 'AI'. The sixth row includes 'AI', 'AI', 'AI', 'AI', 'AI', and 'AI'. The bottom of the interface shows a status bar with 'Domino: 0', 'KM: 0', and 'HN: 56'.

All Q2 Courselets & Quantlets in One-Graph on Platograph



Learning & Coding SVM Algorithms & Applications on Q2

The screenshot shows a software interface for SVM algorithms and applications. The interface is dark-themed and contains several components:

- Top Bar:** Includes user information (Istenna ARCH, 48071), a search bar, and navigation icons. A "CLEAR" button is visible in the top right corner.
- Left Panel:** Features a large scatter plot of data points. Below the plot are buttons for "CLEAR", "PUZZLE", and "SUDOM". A "Path Length: 55" indicator and a "Path-D" dropdown menu are also present.
- Right Panel:** A grid of 28 smaller plots, each with a red 'X' in the bottom right corner. Some plots show classification boundaries, while others are labeled "IMAGE NOT AVAILABLE".
- Bottom Left Text Area:** Contains the following text:

SMSsvmspiral - Wolfgang Härdle, Dedy Dwi Prastyo, Awdesch Melzer |
Quantlet - Multivariate Statistics - Exercises and Solutions plots the area
of two different groups via svm classification using anisotropic
Gaussian kernel for artificial spiral data support vector machines, svm,
classification, kde, kernel density estimation, anisotropic kernel, kernel
SMScartdiag, SMScartsq, SMSdisfbank2, SMSepppbank, SMSsimpdbank,
SMSsimpdsimu, SMSsir2cars, SMSsir2simu, SMSsircars, SMSsirsimu,...
- Bottom Right:** Displays "Domino: 0", "KM: 0", and "HN: 30".

Pathon finding More Related Algorithms & Courses/Courselets

The screenshot displays the Pathon application interface. On the left, a network graph titled "PLATOGRAPH - GROUP 50" shows a dense cluster of nodes. Below the graph are controls for "CLEAR", "PUZZLE", and "BLOOM", along with a "Path Length: 55" indicator and a "Path-D" dropdown menu. The main title of the graph is "Probabilistic Forecasting with Machine Learning and Big Data | Quantinar".

On the right, a grid of 60 course thumbnails is displayed, arranged in 6 rows and 10 columns. The thumbnails include various course covers such as "Applied Machine Learning", "ECONOMETRICS", "Multivariate statistical analysis II", and "Probabilistic Forecasting". Some thumbnails are marked as "IMAGE NOT AVAILABLE".

At the top of the interface, there are navigation tabs for "V1", "DOMINO", "KM", and "HN". At the bottom, the status "Domino: 0", "KM: 0", and "HN: 56" is shown.

There are Much More to train Employees than just Skills



PLATOCGRAPH

格局開創企業轉型的契機

- 世界觀
- 未來觀
- 價值觀



傳統精密製造中小企業



Mindsets, Skills, Innovations, Strategies, Visions



智慧製造 AIoT/ESG



- ❖ 宏觀經濟與數位金融之資本利用投資決策
- ❖ 全球供應鏈之產業升級與技術應用整合接軌
- ❖ 技術創新實作經驗的數學建模與演算模擬團隊組建
- ❖ 具有知識經濟格局的創新思維與量化管理模式
- ❖ 企業傳承與家族企業接班人機互動教育養成

The TuringEuler Project at National Taipei University of Technology



NEXT



Civilization Evolution in 200 Dominoes (Historic Events/Topics)



How our modern civilization has gone through Black Death, Reformation, Renaissance, Scientific Revolution, Enlightenment & Industrial Revolution

One Last Thing: Bruce's Demo of His MMX for Mars Moonshot

