IEEE INDONESIA SECTION | IEEE ComSoc IEEE Communications Society Indonesia Chapter | IEEE Women in Engineering WIE Indonesia Section | UNTAR Universitas Tarumanagara

Women Talks on Communications

Empowering Voices, Engineering Futures: Woman in Engineering Redefining Communications

Special Guest Speakers

PROF. EMERITUS. LANCE FUNG
IEEE R10 DIRECTOR

PROF. TAKAKO HASHIMOTO
IEEE R10 DIRECTOR-ELECT

Keynote Speakers

Dr. Agnes Irwanti
TVRI Supervisory Board
IEEE R10 WIE Committee Chair

Transforming Broadcast Media: Navigating the Digital Landscape

Assoc. Prof. Lely Hiryanto, Ph.D.
UNIVERSITAS TARUMANAGARA

Decision Optimization for Augmentative and Alternative Communication Applications

Dr. Anna Christina Situmorang, ST, MT, IPM
Ministry of Communication and Informatics
IEEE Comsoc Indonesia Chapter Officer

Spectrum Pricing: Indonesia Policy Update and IEEE Research Status

Moderator

CUTIFA SAFITRI, B.CS (HONS)., M.IT., PH.D.
PRESIDENT UNIVERSITY
IEEE ComSoc Indonesia Chapter Officer

Master of Ceremonies

Dr. Nur Afny Catur Andryani, S.Si., M.Sc.
BINUS UNIVERSITY
Chair of WIE AG Indonesia Section

13th May, 2024
12.30 - 16.00 WIB

Universitas Tarumanagara
Tomang, Grogol Petamburan,
Kota Jakarta Barat, Jakarta, Indonesia

Registration Link
https://bit.ly/IEEE-untar

Yth. Peserta “Women Talks on Communication”,

Melalui email ini kami mengucapkan terima kasih sudah berkenan untuk berpartisipasi pada kegiatan “Woman Talks on Communication”. Berikut kami kirimkan detail acara tersebut:

Tanggal: 13 Mei 2024
Waktu: 12.30 WIB
Tempat: Auditorium Lantai 8 Gd. M, UNTAR

Pembicara:
- Dr. Agnes Irwanti (TVRI Supervisory Board, Ketua Komite WIE IEEE R10) - "Transforming Broadcast Media: Navigating the Digital Landscape"
- Lely Hiryanto, Ph.D (Universitas Tarumanagara) - "Decision Optimization for Augmentative and Alternative Communication Applications"
- Dr. Anna Christina Situmorang (Ministry of Communication and Informatics - IEEE ComSoc Indonesia Chapter Officer) - "Spectrum Pricing: Indonesia Policy Update and IEEE Research Status"

Special Guest:
- Prof. Emeritus. Lance Fung (IEEE R10 Director)
- Prof. Takako Hashimoto (IEEE R10 Director-Elect)

Agenda:
12.30-13.00 Registrasi
13.00-13.10 Sambutan Pembuka
13.10-13.30 Sambutan Pembuka oleh Prof. Emeritus. Lance Fung (Direktur IEEE R10)
13.30-14.00 Pembicara 1
14.00-14.30 Pembicara 2
14.30-15.00 Pembicara 3
15.00-15.45 Diskusi
15.45-16.00 Penutup oleh Prof. Takako Hashimoto (Direktur Terpilih IEEE R10)

Jika Anda memiliki pertanyaan atau memerlukan informasi tambahan, jangan ragu untuk menghubungi kami melalui email ini.

Terima kasih atas perhatian dan partisipasinya. Kami berharap dapat bertemu dengan anda di acara Women Talks on Communication!

Salam hangat,
IEEE ComSoc Indonesia Chapter

IEEE INDONESIA SECTION | IEEE ComSoc | UNTAR Universitas Tarumanagara

Certificate of Appreciation

No. : COMIND-02/CERT/05/2024/01

This certificate is proudly presented to

Assoc. Prof. Lely Hiryanto, Ph.D.

For contributing as a **Keynote Speaker** in "Women Talks on Communications"
Held on Monday, 13th May 2024 at Universitas Tarumanagara, Indonesia

Prof. Emeritus. Lance Fung
IEEE R10 Director

IEEE ComSoc
IEEE Communications Society
Indonesia Chapter

Dr. Muhammad Ary Murti
Chair of IEEE ComSoc Indonesia Chapter

UNTAR
Universitas Tarumanagara

UNTAR untuk INDONESIA

DECISION OPTIMIZATION FOR AUGMENTATIVE AND ALTERNATIVE COMMUNICATION APPLICATIONS

LELY HIRYANTO, PH.D.

LECTURER
UNIVERSITAS TARUMANAGARA

Presented in
IEEE ComSoc Indonesia Chapter: Women Talks on Communications
13 Mei 2024

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Outline

- Introduction
- Decision Optimization in General
- Assistive Technology: Augmentative and Alternative Communication
- Visually Interactive Communication and Reading Aid (VICARA)
- What next?

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Introduction

the journey of self learning and the discovery

- Formulate Optimization Problems using Mathematical Model
  - Analyze problem in a way that it can be formulated mathematically, which in turn can be easily solved programmatically.
    - Integer or Mixed Integer Linear Programming
    - Integer or Mixed Integer Non-Linear (Quadratic) Programming
- Green Network Optimization: Energy Saving in Software Defined Networking, Network Routing Protocol and Network Function Virtualization

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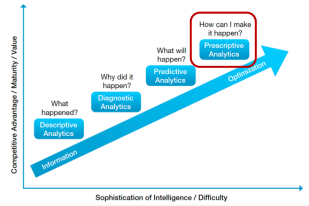
Optimization



Gartner Analytics Maturity Model

- **Optimization**, or Prescriptive analytics, assists users to decide what should they do in order to achieve the best possible goal under a series of conditions.
- Related terms: ***mathematical optimization***, mathematical programming
- Methods: optimization, dynamic programming, greedy-based heuristics, metaheuristics, machine learning, deep learning, genetics algorithms, and many more
- Tools: IBM CPLEX and Gurobi Optimizer, including their APIs for Python, C/C++, Java and C#

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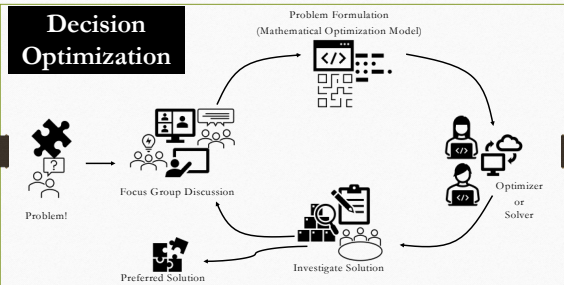
Decision Optimization



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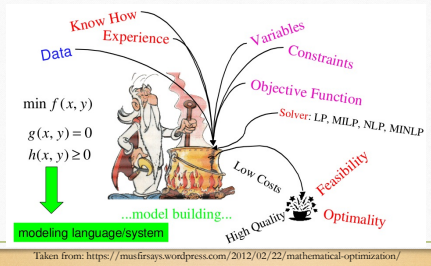
Mathematical Optimization



Taken from: https://musfirsays.wordpress.com/2012/02/22/mathematical-optimization/

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Mathematical Optimization Models

Mixed Integer Non-Linear Programming

$$\text{maximize} \sum_{j=1}^{m}\left(\sum_{i=1}^{n} p_i x_{ij} + \sum_{i=1}^{n-1}\sum_{k=i+1}^{n} q_{ik} x_{ij} x_{kj}\right)$$

subject to

$$\sum_{i=1}^{n} w_i x_{ij} \le c_j, \quad j \in \{1,2,\dots,m\}$$

$$\sum_{j=1}^{m} x_{ij} \le 1, \quad i \in \{1,2,\dots,n\}$$

$$x_{ij} \in \{0,1\}$$

Mixed Integer Non-Linear Constrained Programming

$$\text{maximize} \quad x^T \mu$$

$$\text{subject to} \quad x^T \Sigma x \le \sigma_{\max}$$

$$x \ge 0$$

$$\sum_{i=0}^{n} x_i = 1$$

Integer Linear Programming

$$\text{minimize} \sum_{i=1}^{b} y_i$$

$$\text{subject to} \sum_{j=1}^{n} w_j x_{ij} \le C y_i, \quad i \in \{1,2,\dots,b\}$$

$$\sum_{i}^{b} x_{ij} = 1, \quad j \in \{1,2,\dots,n\}$$

$$y_i,\ x_{ij} \in \{0,1\}, \quad i \in \{1,2,\dots,b\}; j \in \{1,2,\dots,n\}$$

$$\text{minimize} \sum_{i=1}^{n} c_i x_i + \sum_{i=1}^{n} t_{ij} y_{ij}$$

Mixed Integer Linear Programming

$$\text{subject to} \sum_{i=1}^{n} y_{ij} = d_j, \quad j \in \{1,2,\dots,m\}$$

$$0 \le y_{ij} \le d_j x_i, \quad i \in \{1,2,\dots,n\}; j \in \{1,2,\dots,m\}$$

$$x_i \in \{0,1\}, \quad i \in \{1,2,\dots,n\}$$

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Solvers

- Exact Algorithms: Simplex, Branch and Bound, Cutting-Plane, Lagrange-Multipliers
- Greedy-based heuristic algorithms
- Genetic Algorithm
- Swarm Algorithms: Particle Swarm Optimization, Ant Algorithm, Firefly Algorithm
- Reinforcement Learning
- Other machine learning and deep learning algorithms

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Assistive Technologies

- Assistive technologies include any item, piece of equipment or product, whether it is acquired commercially, modified or customized, used to increase, maintain or improve the functional capabilities of individuals with disability.
- Assistive technologies include low vision devices, hearing aids, **augmentative and alternative communication**, walking frames, wheelchairs, and prostheses such as artificial legs.
- Assistive technologies covers information and communications technologies such as computers, screen-reading software and customized phones.
- Assistive technologies play a significant role in enabling people with disability to function and participate.

https://www.atia.org/home/at-resources/what-is-at/

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Augmentative and Alternative Communication (AAC)

- AAC is a therapeutic approach for non-verbal communication that uses symbols:
  - graphics, sounds, movements, tactile symbols (shapes recognized by touch)
- An example of AAC implementation:
  - A mobile application containing Audible Picture Exchange Communication Systems (PECS)
  - Audible PECS is a set of digital picture cards when tapped will generate speech according to the text or label on the card.

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Recent Work in Optimization for AAC

- AAC and Artificial Intelligence by Sennott *et al.* (2019)
- Optimizing Communication in Ataxia: A Multifaceted Approach to Alternative and Augmentative Communication (AAC) by Vogel *et al.* (2024)

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VICARA

- Visually Interactive Communication and Reading Aid
- A free mobile-based AAC application
  - Users: Autistics and Non-Speaking People
- Audible and Digital version of Picture Exchange Card (PEC) System
  - Google Text To Speech API
- 2013: VICARA 1.0 in iOS platform
- 2018: VICARA 2.0 in Android platform

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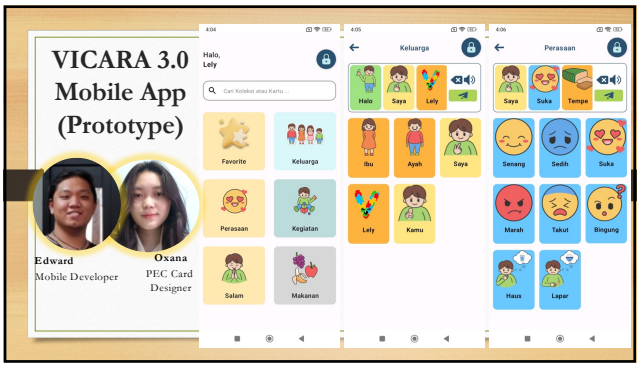

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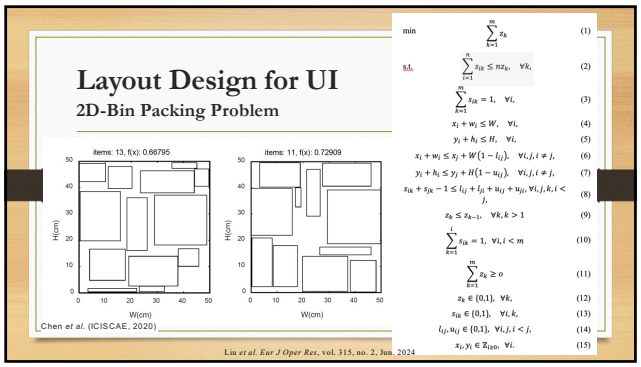

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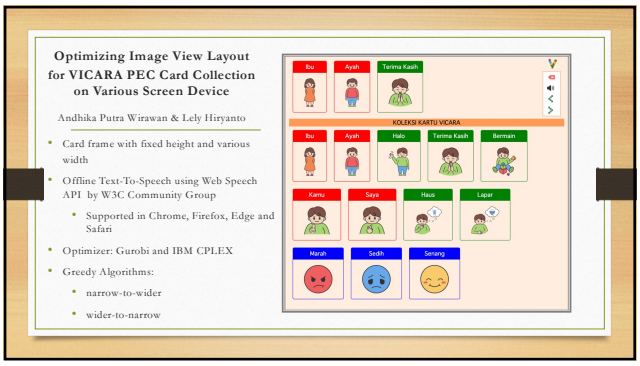

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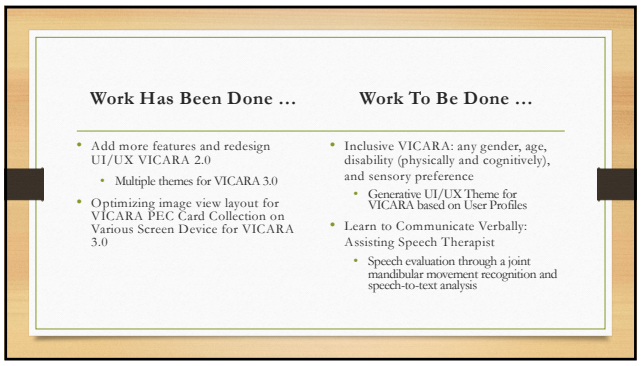

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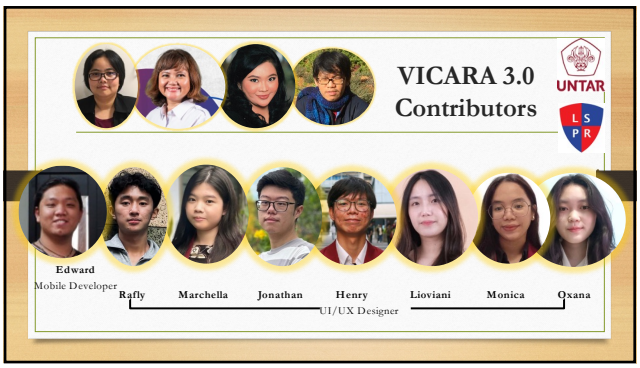
VICARA 3.0
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Jonathan
Henry
UI/UX Designer
Lioviani
Monica
Oxana

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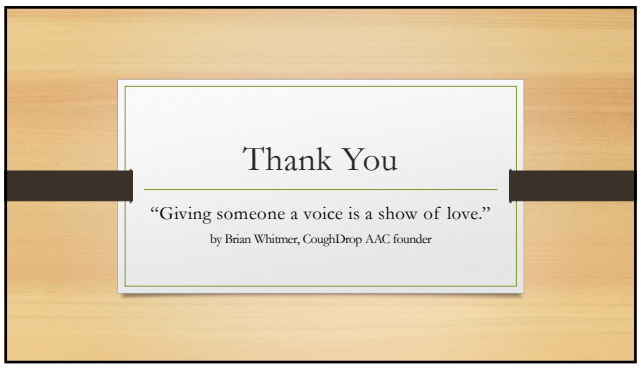
Thank You
"Giving someone a voice is a show of love."
by Brian Whitmer, CoughDrop AAC founder

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