

# CastLab

## Founding Principles

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# 1. Innovation

- Something original and more effective ( ≠ invention).

## Innovation

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From Wikipedia, the free encyclopedia

*For other uses, see [Innovation \(disambiguation\)](#).*

**Innovation** in its modern meaning is "a new idea, creative thoughts, new imaginations in form of device or method".<sup>[1]</sup> Innovation is often also viewed as the application of better solutions that meet new requirements, unarticulated needs, or existing market needs.<sup>[2]</sup> Such innovation takes place through the provision of more-effective products, processes, services, technologies, or business models that are made available to markets, governments and society. An innovation is something original and more effective and, as a consequence, new, that "breaks into" the market or society.<sup>[3]</sup> Innovation is related to, but not the same as, invention,<sup>[4]</sup> as innovation is more apt to involve the practical implementation of an invention (ie new / improved ability) to make a meaningful impact in the market or society,<sup>[5]</sup> and not all innovations require an invention. Innovation often<sup>[quantify]</sup> manifests itself via the engineering process, when the problem being solved is of a technical or scientific nature. The opposite of innovation is exnovation.

While a novel device is often described<sup>[by whom?]</sup> as an innovation, in economics, management science, and other fields of practice and analysis, innovation is generally considered to be the result of a process that brings together various novel ideas in such a way that they affect society. In industrial economics, innovations are created and found<sup>[by whom?]</sup> empirically from services to meet growing consumer demand.<sup>[6][7][8]</sup>

## 2. Thrive for Impactful Research

- **What and why** is more important than how.
- Be bold & ambitious.
- Three approaches for impact
  - Something new (originality)
  - Something big (scale)
  - Something mixed (interdisciplinarity)

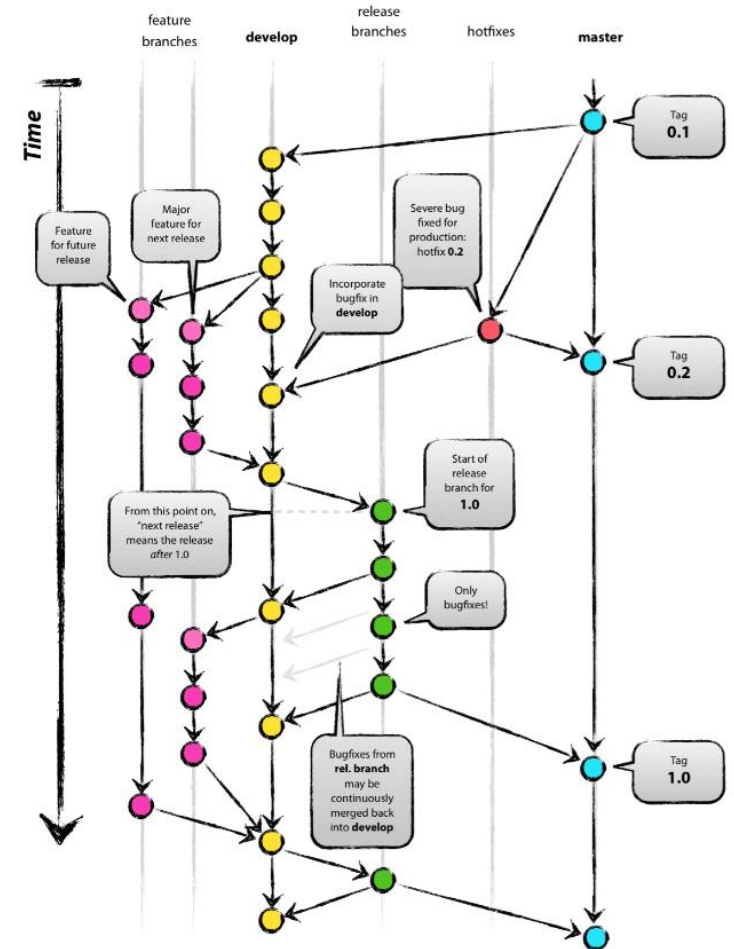
# 3. Globalized & Inclusive

- KAIST EE is world top 20 and working towards top 10.
- Many good students coming from China, South Asia, India, Pakistan, Europe.
- “Inclusiveness” may be slower, but can go further together.
- Diversity is a key for good research.

1	 Massachusetts Institute of Technology (MIT)	<a href="#">More</a>	United States	<input type="checkbox"/>	
2	 Stanford University	<a href="#">More</a>	United States	<input type="checkbox"/>	
3	 ETH Zurich - Swiss Federal Institute of Technology	<a href="#">More</a>	Switzerland	<input type="checkbox"/>	
4	 University of California, Berkeley (UCB)	<a href="#">More</a>	United States	<input type="checkbox"/>	
5	 University of Cambridge	<a href="#">More</a>	United Kingdom	<input type="checkbox"/>	
6	 Nanyang Technological University, Singapore (NTU)	<a href="#">More</a>	Singapore	<input type="checkbox"/>	
=7	 Harvard University	<a href="#">More</a>	United States	<input type="checkbox"/>	
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=9	 EPFL - Ecole Polytechnique Federale de Lausanne	<a href="#">More</a>	Switzerland	<input type="checkbox"/>	
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11	 University of Oxford	<a href="#">More</a>	United Kingdom	<input type="checkbox"/>	
12	 Tsinghua University	<a href="#">More</a>	China (Mainland)	<input type="checkbox"/>	
13	 University of California, Los Angeles (UCLA)	<a href="#">More</a>	United States	<input type="checkbox"/>	
14	 Georgia Institute of Technology	<a href="#">More</a>	United States	<input type="checkbox"/>	
15	 California Institute of Technology (Caltech)	<a href="#">More</a>	United States	<input type="checkbox"/>	
16	 Carnegie Mellon University	<a href="#">More</a>	United States	<input type="checkbox"/>	
17	 The University of Tokyo	<a href="#">More</a>	Japan	<input type="checkbox"/>	
18	 University of Toronto	<a href="#">More</a>	Canada	<input type="checkbox"/>	
19	 KTH Royal Institute of Technology	<a href="#">More</a>	Sweden	<input type="checkbox"/>	
=20	 KAIST - Korea Advanced Institute of Science & Technology	<a href="#">More</a>	South Korea	<input type="checkbox"/>	

# 4. High Quality Engineering

- Will follow Git development flow.
- Always have “code-delivery” in mind.
- Root for **open source** platform.

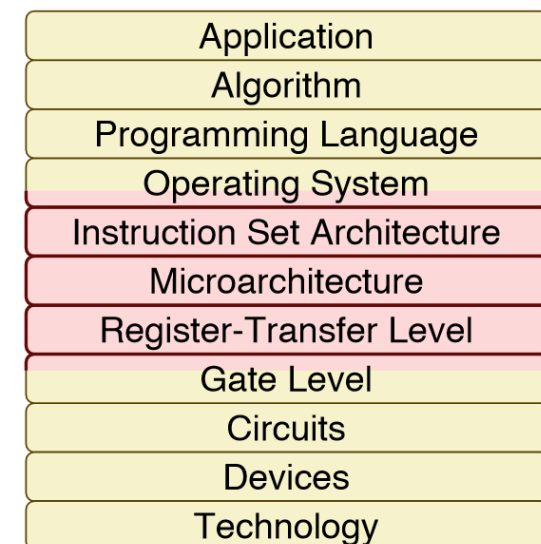
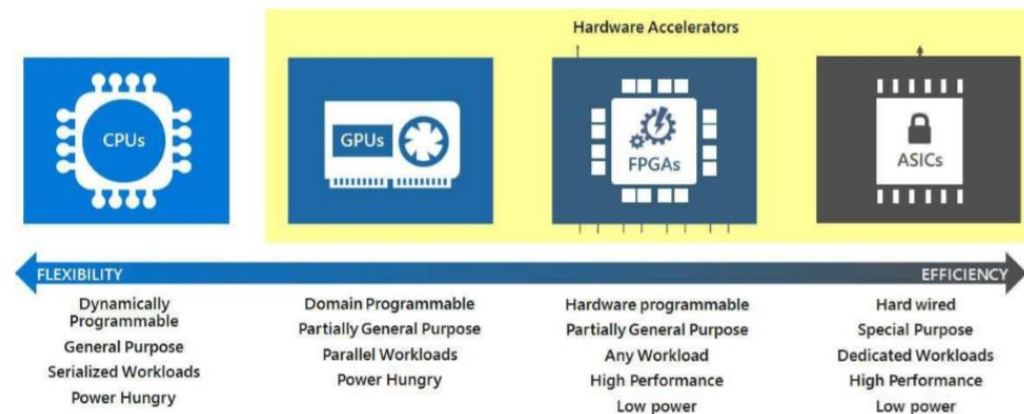


# 5. Team Work

- We work on hardware architecture & design and accelerated computer systems area, which requires a broad research scope and high level of integration.
- Working together as a team and collaborating with other research groups with different background is essential.
- Having a few impactful researches rather than many small individual researches.

# Mission Statement

We aim to advance modern computer systems based on **specialized hardware** in the post-Moore's law era. We conduct research in various fields of hardware design such as computer architecture, VLSI, FPGA, hardware/software co-design, and processing-in-memory with **holistic design approach** to improve overall **system performance**. Our current mission is to build a high-performance and scalable computing platform for future AI applications.



# Research Topics

- Current mission: **build next-gen AI computing platforms**
  - Near Data Processing / Processing-in-Memory
  - Distributed Deep Learning
  - Federated Learning
  - On-Device Learning
  - AI Security
  - Heterogeneous Computing Platform (CPU – GPU – FPGA)



# Typical Graduate Student's Life

- Endless cycle of “reading – writing – presenting” & “design – test – improve”.
  - Requires a lot of dedication, passion, and commitment.



- Becoming a PhD: changing from an enthusiastic student to a **mature** scientist.