Research Career and Topics

Dr. Dongchul Kim

What is your Goal?

1. Long-term goals and Mid-term goals
    a. Always uncertain
2. Short-term goals (after graduation)
    a. Industry
        - Software
        - Database
        - Network
        - System/Cloud
        - Security
        - AI
    b. Academy
        - Graduate school
            - Master or Ph.D.
        - Researcher
        - Faculty

Career in Industry vs Academia

1. Industry
    a. Work in a team
    b. Assigned by a manager
    c. Initiated by a company
    d. High salary
2. Academia
    a. Can work individually
    b. More flexible topics
    c. Self-motivated
    d. Low salary but better Work-Life Balance

What you have to prepare

1. Industry
    a. Resume
        i. Skills
        ii. Projects
        iii. Internships
    b. Coding Interview
    c. Certificates
2. Academy
    a. Research experiences

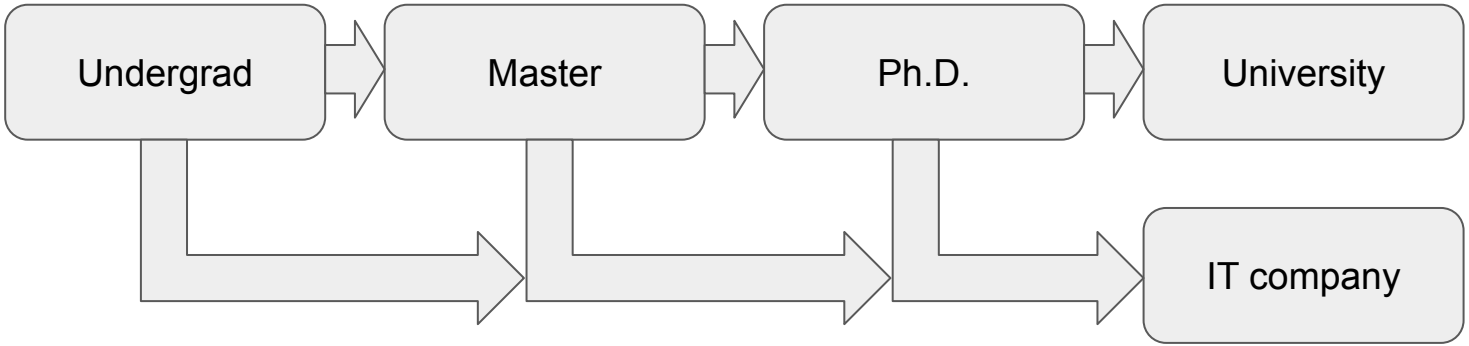
Master Program

- Thesis
- Research with a professor for 2 years
- TA and RA
- PRF in UTRGV

After Master program

1. Ph.D.
    a. **You may want to have research experiences for your future Ph.D.**
    b. Ph.D. program recruiters will review your research experiences
    c. New Ph.D. programs in UTRGV
        i. Ph.D. in Computer Science with Interdisciplinary Applications (Fall 2024)
            - 4~5 years support
2. Working in IT company
    a. Research (thesis) is helpful to extend your AI skills.
    b. Internship and coding interview
    c. FAANG

Goals



Goals

1. Ph.D. in UTRGV
    a. Support tuition and stipend (24K~26K per year)
    b. Less coursework
    c. Less living cost
    d. 4~5 years
2. Master in UTRGV
    a. TA and RA positions available (about $1250 per month)
    b. More experience with AI
    c. 2 years

Professor’s goals

1. Ultimate goals
    a. Finding solutions
    b. Making contributions to research community
    c. Serving students = Providing research opportunity to students (so that they can achieve their goals mentioned above)
2. Practical goals
    a. Publications
    b. External funding
    c. Advising students

Publication

- Conference vs Journal
  - Conferences
    - ICLR, NeurIPS, ICML, AAAI, CVPR
  - Journals
    - IEEE Transactions On Systems, Man And Cybernetics Part B, Cybernetics
    - IEEE Transactions on Neural Networks and Learning Systems
  - https://scholar.google.es/citations?view_op=top_venues&hl=en&vq=eng_artificialintelligence
  - Visit conference and journal homepages
  - Check deadlines
  - Check templates
  - Use Latex (Overleaf)
  - Review process
    - Hit and miss?

Research

- Theory (Algorithm) vs Application
- Problem definition
  - Survey
    - Search review/survey paper
  - Reading paper
    - Select your favorite or milestone papers
  - Implementation
    - Not every papers but baseline paper
    - Benchmarking data
  - Limitation
    - Think of limitation of the baseline or state-of-the-art methods
- Solution
  - Most difficult part
  - Start from the limitations mentioned above
  - Observe experiment results to get idea
  - Get insight from other papers

Research

1. Timeline (4 month for Ph.D. and 8 month for Master)
    a. Survey (including implementation of baseline and state-of-the-art methods)
    b. Solution (including experiment with solutions)
    c. Experiment (including all baselines)
    d. Writing
2. Outline of paper
    a. Title - 0 or 8
    b. Abstract - 7
    c. Intro - 4
    d. Related works - 5
    e. Method - 1
    f. Experiments - 2
    g. Discussion - 3 and Conclusion - 6

Research Lab - MI@UTRGV

https://miutrgv.github.io/

Material Design using Reinforcement Learning

Deep learning-based phase prediction of high-entropy alloys: Optimization, generation, and explanation

https://www.sciencedirect.com/science/article/pii/S0264127520307954

https://www.science.org/doi/10.1126/science.aat2663

Robot Control using Reinforcement Learning

DeepMimic: Example-Guided Deep Reinforcement Learning of Physics-Based Character Skills

https://xbpeng.github.io/projects/DeepMimic/index.html

Durg Design using Reinforcement Learning

Deep reinforcement learning for de novo drug design

https://www.science.org/doi/10.1126/sciadv.aap7885