Seongyong **Park**

Research Scientist · Synergistic Bioinformatics Lab

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"Things which we see are not by themselves what we see... It remains completely unknown to us what the objects may be by themselves and apart from the receptivity of our senses. We know nothing but our manner of perceiving them." ***Immanuel Kant***

Summary

I have over 7 years of experience in bioinformatics and machine learning from my current lab. In the mean time, I managed 'Multi-Component and Multi-Target (MCMT) drug discovery from Traditional Korean Medicine' project and initiated 'Developing AI model for cancer drug discovery' project. Here, I managed databases related to the bioinformatic discovery and closely interact with experimental labs who verify prediction of biomarkers and candidate drugs. I also designed computational methods to harmonize prior knowledge of disease gene and mechanisms based on knowledge network and gene expression datasets. I also managed CPU/GPU clusters in current lab to perform high-performance computating (HPC).

My major research topic for MCMT project is developing computational methods to optimize gene expression marker set to explain clinical and model organism responses at the same time, based on the prior knowledge related to the disease mechanisms. I have co-authored several patents and peer-reviewed articles related to bioinformatics and machine learning. For bioinformatic applications, I studied gene expression based prognostic model development, assay oriented marker set optimization, and drug repurposing. I'm also interested in applying statistial/machine/deep learning in various other topics such as application of overlap statistics, sequence based protein classification, protein interaction prediction, spectral signal processing including EEG and SERS.

Before join current lab, I studied microfluidics at UNIST and EEG biosignal processing in domestic venture company. I developed microfluidic chips to study synthetic/predatory bacterial cells and performed quantitative biological experiments using these devices. I analyzed response of flower odor using EEG signal processing using frequency domain analysis of EEG signal. These experiences lead me to study bioinformatics/machine learning and I hope to persue more studies on these topics.

Work Experience

Synergistic Bioinformatics Lab, KAIST. *Daejeon, S.Korea*

Ph.D. Research Scholar *(Aug. 2015 - –)*

- research, design and implement algorithms in graph theory, machine learning and deep learning for development of gene expression based diagnostic & prognostic models and drug candidate prediction models.
- apply theoretical expertise and innovation to generate patents and publications in top-ranked journals.
- using wide range of tools to acquire information and interpret data, writing up reports and presenting finding.

Synergistic Bioinformatics Lab, KAIST. *Daejeon, S.Korea*

Researcher *Aug. 2014 - Aug, 2015*

- research, design and implement algorithms in graph theory, machine learning and deep learning for development of gene expression based diagnostic & prognostic models and drug candidate prediction models.
- apply theoretical expertise and innovation to generate patents and publications in top-ranked journals.
- using wide range of tools to acquire information and interpret data, writing up reports and presenting finding.

Biobrain Inc. *Daejeon, S.Korea*

Researcher *Aug. 2012 - Aug, 2014*

- research, design and implement biosignal processing algorithms for EEG applications.
- using wide range of tools to acquire information and interpret data, writing up reports and presenting finding.

Planning and Evaluation Office, Korea Institute of Energy Technology Evaluation and Planning (KETEP). *Seoul, S.Korea*

Researcher *Feb. 2012 - Aug, 2012*

- Evaluation of research project associated with renewable energy.
- writing research trend reports.
- attending staff meetings and general administration.

Skills

Expertise	Bioinformatics, Machine Learning, Network Science, Signal Processing
Programming	R, Python, MATLAB, TensorFlow, Keras, Pytorch, LaTeX
Languages	Korean, English

Publication Highlights

Patents & Patent Applications

1. Taesung Kim and **Seongyong Park**. "Microfluidic concentrator array for observing predation behavior of microbes." ***KR. Patent 1012385560000, App. 1020100110945, issued Febrary 22, 2013.*** [online]
2. Taesung Kim and **Seongyong Park**. "Microfluidic concentrator for communication assays of microbes." ***KR. Patent 1013304730000, App. 1020110073766, issued Febrary 04, 2013.*** [online]
3. Bumki Min, Gwansu Yi and **Seongyong Park**. "System and method for disease prediction based on group marker consisting of genes having similar function." ***KR. Patent 1022361940000, App. 1020200145453, issued Mar 30, 2021.*** [online]

Peer-Reviewed Journal Papers

1. Woon Sun Choi, Dogyeong Ha, **Seongyong Park**, Taesung Kim. "Synthetic multicellular cell-to-cell communication in inkjet printed bacterial cell systems" ***Biomaterials***, April, 2011, [online]
2. **Seongyong Park**, Dasol Kim, Robert J Mitchell, Taesung Kim. "A microfluidic concentrator array for quantitative predation assays of predatory microbes" ***Lab on a Chip***, September, 2011, [online]
3. Vinuselvi Parisutham, **Seongyong Park**, Minseok Kim, Jung Min Park, Taesung Kim, Sung Kuk Lee. "Microfluidic Technologies for Synthetic Biology" ***Int J Mol Sci.***, December, 2011, [online]
4. Woon Sun Choi, Minseok Kim, **Seongyong Park**, Sung Kuk Lee, Taesung Kim. "Microfabricated ratchet structure integrated concentrator arrays for synthetic bacterial cell-to-cell communication assays" ***Lab on a Chip***, January, 2012 [online]
5. **Seongyong Park**, Xiaoqiang Hong, Woon Sun Choi, Taesung Kim. "Microfabricated ratchet structure integrated concentrator arrays for synthetic bacterial cell-to-cell communication assays" ***Lab on a Chip***, June, 2012, [online]
6. Sung Min Kim, **Seongyong Park**, Jong Won Hong, Eu Jean Jang, Chun Ho Pak. "Psychophysiological Effects of Orchid and Rose Fragrances on Humans" ***Hortic Sci Technol***, June, 2016, [online]
7. Yoon Hyeok Lee, Hojae Choi, **Seongyong Park**, Boah Lee, Gwansu Yi. "Drug repositioning for enzyme modulator based on human metabolite-likeness" ***BMC Bioinformatics***, May, 2017, [online]
8. Muhammad Usman, Shujaat Khan, **Seongyong Park**, Abdul Wahab. "AFP-SRC: Identification of Antifreeze Proteins Using Sparse Representation Classifier." ***Neural Computing and Applications***, September. 2021, [online]
9. Muhammad Usman, Shujaat Khan, **Seongyong Park**, Jeong-A Lee. "AoP-LSE: Antioxidant Proteins Classification Using Deep Latent Space Encoding of Sequence Features." ***Current Issues in Molecular Biology: (Bioinformatics and Systems Biology section)***, October. 2021, [online]
10. **Seongyong Park**, Jaeseok Lee, Shujaat Khan, Abdul Wahab, Minseok Kim. "SERSNet: Surface Enhanced Raman Spectroscopy based Bio-Molecule Detection using Deep Neural Network" ***Biosensors***, November, 2021, [online]
11. **Seongyong Park**, Jaeseok Lee, Shujaat Khan, Abdul Wahab, Minseok Kim. "Machine Learning-based Heavy Metal Ion Detection Using Surface-Enhanced Raman Spectroscopy" ***Sensors***, January, 2022, [online]
12. **Seongyong Park**, Gwansu Yi. "Development of Gene Expression-Based Random Forest Model for Predicting Neoadjuvant Chemotherapy Response in Triple-Negative Breast Cancer" ***Cancers***, Febrary, 2022, [online]

Abstracts, Posters and Conference Proceedings

1. **Seongyong Park**, Dasol Kim, Robert J. Mitchell, Taesung Kim. "A Bacteria-on-a-chip: Understanding on the Predation Rate of Predatory Prokaryotes." in ***Biochip. 2010, Seoul, S.Korea.***
2. **Seongyong Park**, Sunjang Lee, Dasol Kim, Robert J. Mitchell, Taesung Kim. "High Throughput Screening of Predatory Bacterial Microbes using Chemotaxis." in ***KSME Spring Conference on Bioengineering Division. 2010, Jeju, S.Korea.***
3. **Seongyong Park**, Dasol Kim, Robert J. Mitchell, Taesung Kim. "A Microfluidic Concentrator Array for Studying Predatory Bacterial Microbes." in ***MicroTAS. 2010, Groningen, Netherland.***
4. **Seongyong Park**, Dasol Kim, Robert J. Mitchell, Taesung Kim. "A Microfluidic Concentrator Array for Quantifying Predation by Predatory Microbes Toward Its Prey." in ***Biochip. 2011, Ulsan, S.Korea.***
5. **Seongyong Park**, Sunjang Lee, Dasol Kim, Robert J. Mitchell, Taesung Kim. "Bacterial Cell-to-Cell Communication Assays in Microfabricated Concentrator Array Device." in ***KSME Spring Conference on Bioengineering Division. 2011, Pohang, S.Korea.***
6. **Seongyong Park**, Xiaoqiang Hong, Minseok Kim, Woon Sun Choi, Taesung Kim. "Bacterial Cell-to-cell Communication Assays in A Micro-fabricated Concentrator Array Device." in ***MicroTAS. 2011, Seattle, USA.***
7. **Seongyong Park**, Xiaoqiang Hong, Minseok Kim, Woon Sun Choi, Taesung Kim. "Bacterial Cell-to-cell Communication Assays in A Micro-fabricated Concentrator Array Device." in ***ISMM. 2011, Seoul, Korea.***
8. **Seongyong Park**, Muhammad Moinuddin, Ubaid M. Al-Saggaf. "GSSMD: A new standardized effect size measure to improve robustness and interpretability in biological applications," in ***2020 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)***, Seoul, Korea (South), 2020, pp. 1096-1099, [online]

pre-prints & in-review

1. Seongyong Park, **Shujaat Khan**, Abdul Wahab. "E3-targetPred: Prediction of E3-target proteins using deep latent space encoding." In revision: ***IEEE/ACM Transactions on Computational Biology and Bioinformatics***, (since May. 2021). [online]

Education

KAIST(Korea Advanced Institute of Science and Technology)

Daejeon, S.Korea

PH.D. IN BIO & BRAIN ENGINEERING

Aug. 2015 - –

- Got the KAIST student scholarship which is given to promising students.

UNIST(Ulsan National Institute of Science and Technology)

Ulsan, S.Korea

M.S. IN MECHANICAL ENGINEERING

Mar. 2010 - Feb. 2012

- *Thesis*: Microfluidic Concentrator Array for Quantitative Predation Study of Predatory Microbes[online]
- Got the UNIST student scholarship which is given to promising students.

PKNU (Pukyung National University)

Busan, S.Korea

B.E. IN MECHANICAL ENGINEERING

Mar. 2002 - Feb. 2010

- Got BK21 scholarships which are given to top-ranked students in each Dept.