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# 김동영 (金炯瑩) 이력서

과학과 공학을 위한 인공지능 및 빅 데이터 연구

Dongyoung Kim, Ph.D., Artificial intelligence for science and engineering

Date of birth: 1987.05.26

AI professional @ Data Analytics Laboratory,

Samsung Life Insurance, Seoul, Republic of Korea

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## 경력

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2020 – 현재	<b>삼성생명</b> (Samsung Life Insurance) 데이터분석연구소 Data Analytics Laboratory, AI Professional.
2017 – 2019	한국 기초과학연구원 (Institute for Basic Science), 첨단연성물질 연구단 연구요원 (Research Fellow), 지도교수: 조윤경 (UNIST).
2012 – 2016	미국 <b>Texas A&amp;M University</b> 연구원 (Research Assistant) 지도교수: Raimund Ober (Texas A&M University).
2010 – 2012	미국 <b>The University of Southwestern medical center</b> 연구원 (Research Assistant)
2010 – 2012	미국 <b>The University of Texas at Dallas</b> 연구원 (Research Assistant)
2009 – 2010	<b>임베디드소프트웨어 연구센터</b> 연구원 (Research Assistant)
2010 – 2010	호주 <b>EOS Australia</b> 인턴쉽

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## 학력

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2012 – 2016	미국 <b>Texas A&amp;M University</b> 의공학 박사 (Ph.D.) College station, Texas, USA
2010 – 2012	미국 <b>The University of Texas at Dallas</b> 전자공학 학사 (B.S.) Richardson, Texas, USA
2006 – 2012	<b>경북대학교 전자 컴퓨터 공학 학사</b> , 대구, 대한민국

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## 프로젝트

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- 2020 – 현재 **광학 이미지 문서의 디지털화를 위한 인공지능 기반 OCR framework**
- 여러 인공지능 기술을 사용하여 광학적으로 수집된 문서 이미지를 디지털화 하는 인공지능 설계.
  - Convolutional neural network, generative adversarial network, graph convolutional network, recurrent neural network, transformer network 및 reinforcement learning 등의 다양한 인공지능 기술로 이루어진 이미지/언어 처리 엔진.
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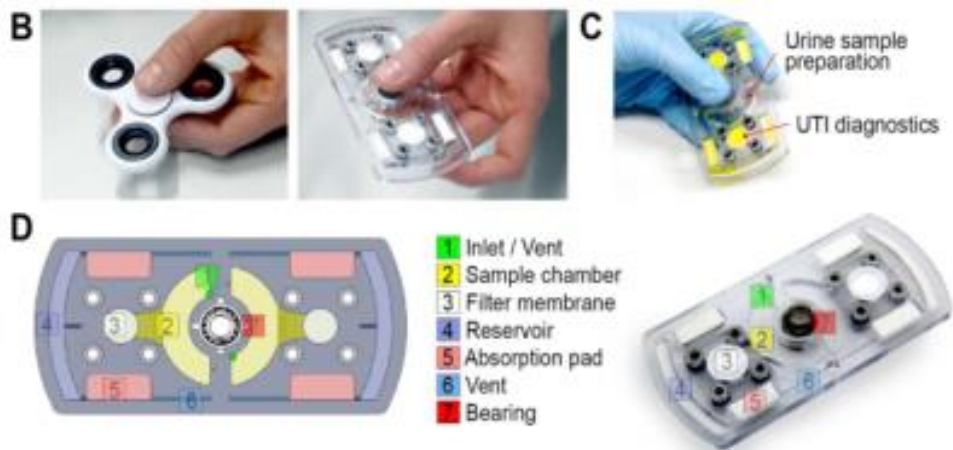
- 2020 – 현재 **인공지능 광학 이미지 문서 simulator**
- Generative adversarial network 를 이용한 광학 이미지 문서 Simulator.

### 관련 특허

- 김동영, 광명성, 원은지, 광학이미지문서 생성을 위한 인공지능 기반 시뮬레이터, 한국특허출원, 2020.
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- 2020 – 현재 **인공지능 모델 및 데이터 관리를 위한 AI data/model management framework**
- 여러 유형의 인공지능 모델, 실험, 데이터 관리를 위한 framework 개발.
  - Light memory database 를 사용한 데이터 저장/관리 최적화
  - MLFlow 를 이용한 모델, 실험관리 및 인공지능 model production 수행.
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- 2017 – 2020 **A fidget spinner for the point-of-care diagnosis of urinary tract infection**



- Hand-powered microfluidic system 을 이용한 bacterial cell enrichment
  - Urine 내의 bacterial 함량 및 drug resistance test
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### 관련 특허

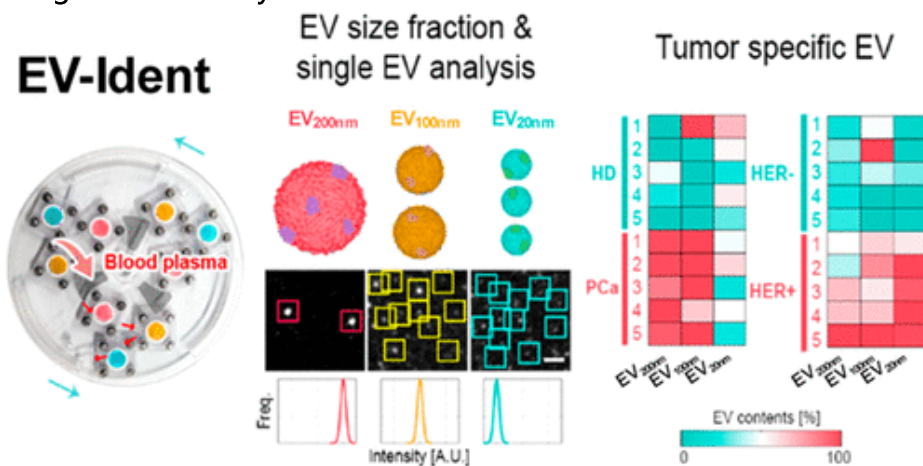
- 김동영, 미카엘 아이작, 기동엽, 조윤경, 원심력 기반 무전원 입자 농축장치 및 입자 농축방법(Centrifugal force based non-powered particle concentration apparatus and method of particle concentration). 한국특허 1021037840000, 2020.
- 김동영, 김치주, 기동엽, 조윤경, 원심력 기반 혈소판 분리 및 검진 장치(Centrifugal force based platelet isolation and testing system). 한국특허 1020638650000, 2020.

### 관련 논문

\*Kim, D., Michael, I., Gulenko, O., Kumar, S., Kumar, S., Clara, J., ... Cho, Y.-K. (2020). A fidget spinner for the point-of-care diagnosis of urinary tract infection. Nature Biomedical Engineering. <https://doi.org/10.1038/s41551-020-0557-2>

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2017 – 2020 EV-Ident: Identifying Tumor-Specific Extracellular Vesicles by Size Fractionation and Single-Vesicle Analysis

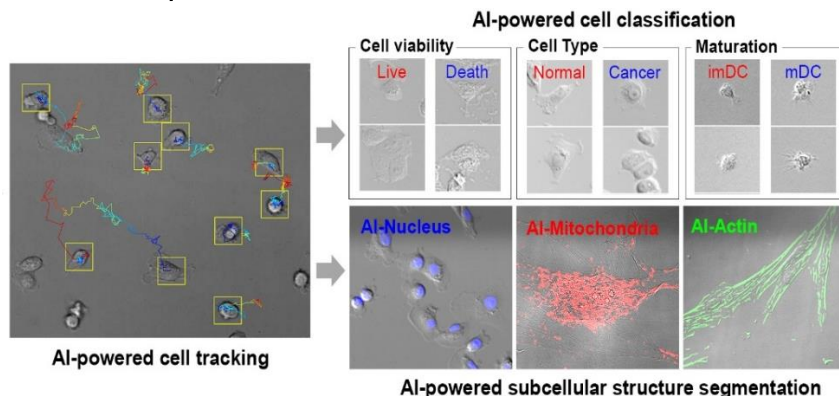


- Microfluidic system 을 이용한 EV size fraction 및 fluorescence labeling.
- Single particle imaging 기술을 이용한 EV Ident.
- Particle modeling / localization optimization 를 통해 정확한 marker expression 측정.
- Unsupervised / supervised machine learning 을 이용한 EV 정보 검출
- 암관련 EV 측정.

### 관련 논문

\*Kim, D., Woo, H.-K., Lee, C., Min, Y., Kumar, S., Sunkara, V., ... Cho, Y.-K. (2020). EV-Ident: Identifying Tumor-Specific Extracellular Vesicles by Size Fractionation and Single-Vesicle Analysis. *Analytical Chemistry*, 92(8), 6010–6018. <https://doi.org/10.1021/acs.analchem.0c00285>

2017 – 2019 인공지능 현미경 (AI-powered transmitted light microscopy for functional analysis of live cells).



- Unsupervised machine learning 과 supervised semantic segmentation 을 이용한 transmitted light microscopy image 를 fluorescence microscopy image 로 바꾸는 기술.
- Region proposal convolutional neural network 및 convolutional neural network 를 이용한 transmitted light microscopy image 내의 세포 상태 실시간 모니터링.
- Time-lapse 영상 내의 세포를 complementary learner 를 이용한 tracking 및 모니터링.

### 관련 특허

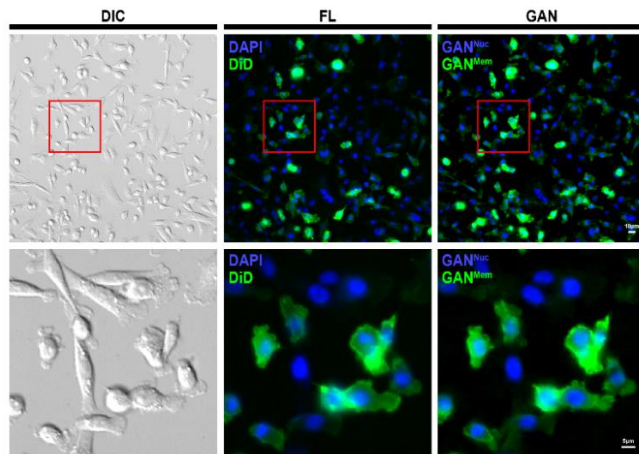
- 김동영, 민유홍, 조윤경,인공신경망을 이용한 특수 현미경 영상 생성 방법 및 영상 처리 장치(GENERATING METHOD FOR SPECIALIZED MICROSCOPE IMAGES USING ARTIFICIAL NEURAL NETWORK AND IMAGE PROCESSING APPARATUS). 한국특허 1020846820000, 2020.

- 김동영, 민유홍, 조윤경, 인공신경망을 이용한 세포 영상 분석 방법 및 세포 영상 처리 장치(ANALYSING METHOD FOR CELL IMAGE USING ARTIFICIAL NEURAL NETWORK AND IMAGE PROCESSING APPARATUS FOR CELL IMAGE). 한국특허 1020846830000, 2020.

관련 논문

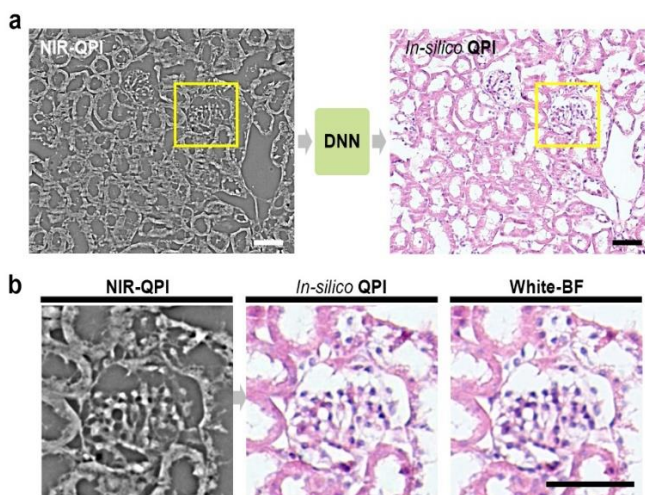
\*Kim, D., Min, Y., Oh, J.M. et al. AI-powered transmitted light microscopy for functional analysis of live cells. Sci Rep 9, 18428 (2019) doi:10.1038/s41598-019-54961-x

2019 – 2020 인공지능망을 이용한 형광 표식변환 (In-silico fluorescence staining using generative adversarial network).



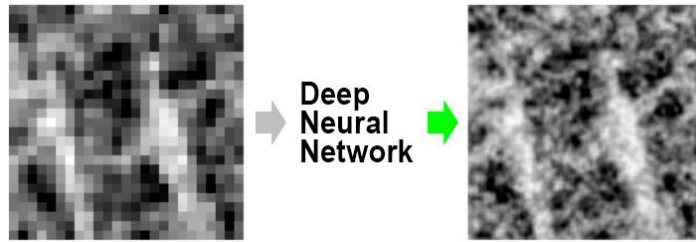
- GAN 을 이용해 시료의 diffraction pattern 에서 형광 염색을 복원하는 기술  
\*Manuscript under preparation (2019).

2019 – 2020 인공지능망을 이용한 조직학 이미지 생성 (In-silico histology staining using generative adversarial network).



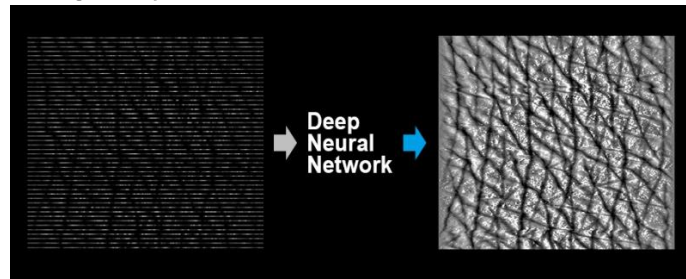
- GAN 을 이용해 시료의 phase 정보로부터 색상 염색을 복원하는 기술.  
\*Manuscript submitted (2020).

2019 – 2020    **인공신경망을 통한 고해상도 의료영상 복원 (Generative adversarial network for high definition medical image).**



\*Manuscript under preparation (2020).

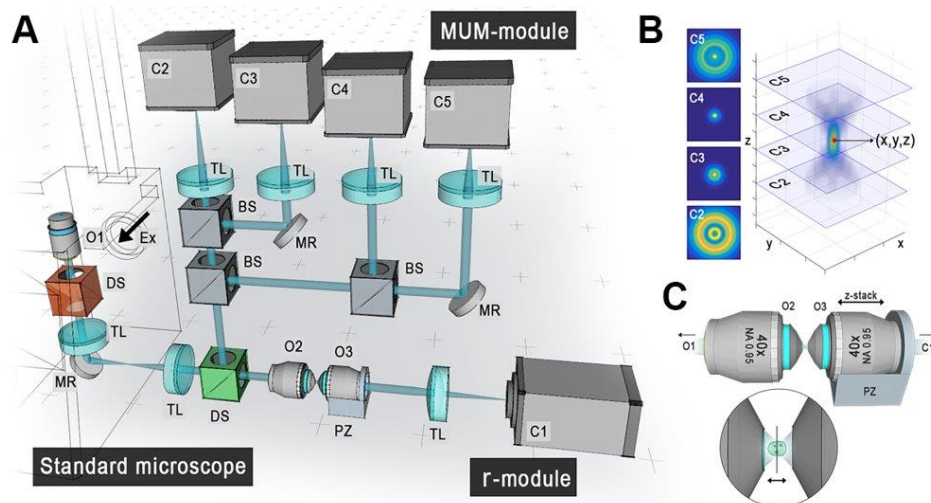
2019 – 2020    **인공신경망을 통한 초고속 의료영상 촬영 (Generative adversarial network for rapid medical image acquisition).**



- GAN 을 이용해 의료영상 촬영 시간을 1/10 수준으로 단축시키는 기술.

\*Manuscript submitted (2020).

2014 – 2016    **세포내 분자 및 환경의 다차원 관찰을 위한 현미경 (Remote focusing multifocal plane microscopy for the imaging of 3D single molecule dynamics with cellular context)**



- 세포 내 분자의 움직임과 그 주변환경을 3 차원 영상으로 보여주는 기술.

- 영상으로부터 분자의 3 차원 위치를 10 nm 정확도로 추정.

- 주변환경의 3 차원 영상을 광학 허상으로부터 기록.

### 관련 특허

- Kim D., Ober R.J, **Advanced multi-dimensional microscopy system for single particle & structure imaging.** U.S. Patent, 2017.)

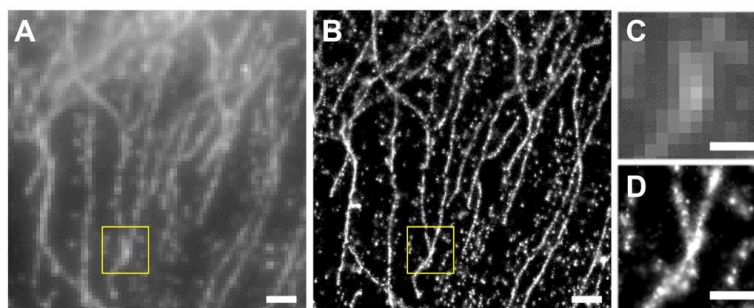
### 관련 논문

\*Kim, D., Chao, J., Velmurugan, R., You, S., Ward, E. S., and Ober, R. J. **Remote focusing multifocal plane microscopy for the imaging of 3D single molecule dynamics with cellular context.** Proceedings of the SPIE, Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXIV, 10070: 2017.

\*Kim D, You S, Ward E.S., Ober R.J, **Imaging of three-dimensional single molecule dynamics with cellular context: Antibody trafficking and interaction with cell membrane and sorting endosomes.** ASCB, San Fransisco, CA. 2016.

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## 2012 – 2015 3 차원 초고해상도 광학 현미경 (3D Super resolution microscopy)



- 광학현미경을 이용하여 5 nm 초고해상도의 형광 영상을 얻어내는 기술.
- 다초점 기술 (multifocal plane microscopy) 의 적용으로 3 차원 가능.

### 관련 논문

\*Cohen E. A. K., Kim D., Ober R.J, **Cramer-Rao Lower Bound for Point Based Image Registration with Heteroscedastic Error Model for Application in Single Molecule Microscopy.** IEEE Transactions on Medical Imaging 2015

\*Ram S, Kim D, Ober RJ, Ward ES. **3D Single Molecule Tracking with Multifocal Plane Microscopy Reveals Rapid Intercellular Transferrin Transport at Epithelial Cell Barriers.** Biophysical Journal 2012

## 특허

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김동영, 광명성, 원은지, 광학이미지문서 생성을 위한 인공지능 기반 시뮬레이터 (METHOD FOR MANAGING TRAINING DATA FOR OPTICAL CHARACTER RECOGNITION), 한국특허출원 1020200059652, 2020.

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김동영, 민유홍, 조윤경, 인공지능을 이용한 특수 현미경 영상 생성 방법 및 영상 처리 장치(GENERATING METHOD FOR SPECIALIZED MICROSCOPE IMAGES USING ARTIFICIAL NEURAL NETWORK AND IMAGE PROCESSING APPARATUS). 한국특허 1020846820000, 2020.

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김동영, 민유홍, 조윤경, 인공지능을 이용한 세포 영상 분석 방법 및 세포 영상 처리 장치(ANALYSING METHOD FOR CELL IMAGE USING ARTIFICIAL NEURAL NETWORK AND IMAGE PROCESSING APPARATUS FOR CELL IMAGE). 한국특허 1020846830000, 2020.

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김동영, 미카엘 아이작, 기동엽, 조윤경, 원심력 기반 무전원 입자 농축장치 및 입자 농축방법(Centrifugal force based non-powered particle concentration apparatus and method of particle concentration). 한국특허 1021037840000, 2020.

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김동영, 김치주, 기동엽, 조윤경, 원심력 기반 혈소판 분리 및 검진 장치(Centrifugal force based platelet isolation and testing system). 한국특허 1020638650000, 2020.

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Kim D., Ober R.J, **Advanced multi-dimensional microscopy system for single particle & structure imaging**. U.S. Patent, 2017.

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## 수상

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2018 The 22<sup>nd</sup> International Conference On **Miniaturized Systems For Chemistry And Life Sciences**, Shark Tank Competition 1 위

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2016 스위스 **SMLMS Challenge (EPFL)**  
3D single molecule localization microscopy 부문 1 위

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2014 – 2016 미국 **Texas A&M University** 연구 장학금

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2012 – 2014 미국 **The University of Texas at Dallas** 연구 장학금

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2011 – 2011 미국 **The University of Texas at Dallas** 학사 연구 장학금

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2011 – 2011 미국 **The University of Texas at Dallas** Senior Design Project 2 위

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2010 – 2012 미국 **The University of Texas at Dallas** 학사 장학금

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## 언어

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한국어 모국어, 영어 유창함

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## 기술

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인공지능	Supervised/unsupervised machine learning model 개발, Deep learning model 개발. Model/data management framework 개발.
프로그래밍	MATLAB, Python, C, C++, JAVA.
데이터 처리	Big data analysis, Optimization based data processing.
시스템 설계	NI LabWindows/CVI, NI LabView.
광학설계	Zemax based optical system design, Multimodal optical system configuration.
현미경	형광 현미경 설계 및 제작 (Epifluorescence, TIRF microscopy, Confocal microscopy) 단일 분자 현미경/초고해상도 형광 현미경 설계 및 제작 (Single molecule microscopy, super-resolution microscopy) 전자현미경 사용 (Transmitted/scanning electron microscopy)

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## 강의

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BME21101 Introduction to biomedical engineering (Introduction to artificial intelligence for biomedical engineering / Introduction to deep learning), 2019, Ulsan National Institute of Science and Technology (UNIST).

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## 논문

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Kim, D., Min, Y., Oh, J.M. et al. **AI-powered transmitted light microscopy for functional analysis of live cells.** Sci Rep 9, 18428, 2019

Kim, D., Woo, H.-K., Lee, C., Min, Y., Kumar, S., Sunkara, V., ... Cho, Y.-K. (2020). **EV-Ident: Identifying Tumor-Specific Extracellular Vesicles by Size Fractionation and Single-Vesicle Analysis.** Analytical Chemistry, 92(8), 6010–6018.

Kim, D., Michael, I., Gulenko, O., Kumar, S., Kumar, S., Clara, J., ... Cho, Y.-K. (2020). **A fidget spinner for the point-of-care diagnosis of urinary tract infection.** Nature Biomedical Engineering.

Sunkara, V., Kim C., Park J., Woo H., Kim D., Ha H., Kim M., Son Y., Kim J., Cho Y., **Fully automated, label-free isolation of extracellular vesicles from whole blood for cancer diagnosis and monitoring.** Theranostics, 2019.

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Michael I., Kumar S., Oh J., **Kim D**, Kim J., Cho Y. **Surface Engineered Paper Hanging Drop Chip for 3D Spheroid Culture and Analysis**. ACS applied materials & interfaces, 2018.

Li, R., Chiguru, S., Li, L., **Kim, D.**, Velmurugan, R., Kim, D., Tian, H., Schroit, A., Mason, R., Ober, R. J. and Ward, E. S. **Targeting phosphatidylserine with calcium-dependent protein-drug conjugates for the treatment of cancer**. Molecular Cancer Therapeutics, 2018.

Devanaboyina, S. C., Khare, P., Challa, **Kim, D.**, Ober, R. J., and Ward, E. S. **Engineered clearing agents for the selective depletion of antigen-specific antibodies**. Nature Communications, 2017.

**Kim, D.**, Chao, J., Velmurugan, R., You, S., Ward, E. S., and Ober, R. J. **Remote focusing multifocal plane microscopy for the imaging of 3D single molecule dynamics with cellular context**. Proceedings of the SPIE, Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXIV, 10070: 2017.

Vahid, M. R., Chao, J., **Kim, D.**, Ward, E. S., and Ober, R. J. **State space approach to single molecule localization in fluorescence microscopy**. Biomedical Optics Express, 2017

Poovasery J.S., Kang J.C., **Kim D**, Ober R.J, Ward E.S. **Antibody targeting of HER2/HER3 signaling overcomes heregulin-induced resistance to PI3K inhibition in prostate cancer**. International Journal of Cancer 2017

**Kim D**, You S, Ward E.S., Ober R.J, **Imaging of three-dimensional single molecule dynamics with cellular context: Antibody trafficking and interaction with cell membrane and sorting endosomes**. ASCB, San Francisco, CA. 2016.

Cohen E. A. K., **Kim D.**, Ober R.J, **Cramer-Rao Lower Bound for Point Based Image Registration with Heteroscedastic Error Model for Application in Single Molecule Microscopy**. IEEE Transactions on Medical Imaging 2015

Ram S, **Kim D**, Ober RJ, Ward ES. **The level of HER2 expression is a predictor of antibody-HER2 trafficking behavior in cancer cells**. mAbs 2014

Devanaboyina SC, Lynch SM, Ober RJ, Ram S, **Kim D**, Puig-Canto A, Breen S, Kasturirangan S, Fowler S, Peng L, et al. **The effect of pH dependence of antibody-antigen interactions on subcellular trafficking dynamics**. mAbs 2013

Ram S, **Kim D**, Ober RJ, Ward ES. **Microscopy in Polarized Epithelia Reveals a Novel Cellular Process of Intercellular Transfer**. Biophysical Journal 2013

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Ram S, Kim D, Ober RJ, Ward ES. **3D Single Molecule Tracking with Multifocal Plane Microscopy Reveals Rapid Intercellular Transferrin Transport at Epithelial Cell Barriers**. Biophysical Journal 2012

Kim D, Ram S, Ober RJ, Ward ES. **3D single molecule tracking of rapid intracellular trafficking imaged by multifocal plane microscopy** Microscopy and Microanalysis 2012.

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