

EDUCATION & PROFESSIONAL APPOINTMENTS

- 2022 - present Lecturer (Assistant Prof.), Biological and Experimental Psychology, Queen Mary U. of London
- 2018 - 2022 Research Associate, Computational & Biological Learning Lab, Engineering Dept., Cambridge U.
Supervisor: Prof. Máté Lengyel (in collaboration with Prof. Daniel Wolpert at Columbia Univ.)
- 2019 - 2022 Junior Research Fellow, Wolfson College, University of Cambridge
Elected through competition (< 5% of all Cambridge postdocs) based on excellence in research; serving as a member of the College and the University's Governing Body.
- 2012 - 2017 PhD, Neurobiology & Behavior, Columbia University, New York, NY, USA
Supervisor: Prof. Michael Shadlen
Thesis title: "Inferring Decision Rules from Evidence, Choice, and Reaction Times" ([link](#))
- 2013 - 2016 Trainee, Vision Training Grant, National Eye Institute, USA
Chosen as the NEI Vision Training Grant Trainee (**1 student/year in the department**) and received tuition and stipend (~\$152K)
- 2008 - 2011 Head Physician (military duty), Incheon Public Health Centre, South Korea
- 2002 - 2008 Medical Doctor, Seoul National University College of Medicine, Seoul, South Korea
Awarded an MD from the top medical school in South Korea.
- 2003 Scholarship for short-term overseas studies, Seoul National University (~\$2K)
: Attended UCLA Summer sessions
- 2002 - 2004 Scholarship for tuition, Seoul National University (~\$9K)
- 2002 Case Fellow, Case Inc., South Korea (~\$1K)
- 1999 - 2000 Summer/Winter Schools for International Olympiad in Informatics, South Korea
Chosen through a **national competition (10 students/year in the country)**, trained in algorithms, including dynamic programming, graph theory, and stochastic optimization, supported by the government to represent the country.

PUBLICATIONS - PUBLISHED

(@: corresponding author; †: equal contributions)

Kang YHR[@], Löffler A^{*}, Jeurissen D^{*}, Zylberberg A[†], Wolpert DM[†], Shadlen MN^{†@} (2021), *Multiple decisions about one object involve parallel sensory acquisition but time-multiplexed evidence incorporation*. **eLife** 10, [e63721](https://doi.org/10.7554/eLife.63721).

⇒ Impact factor: **8.140**

⇒ Selected as a **Contributed Talk at Cosyne** in 2021 (**top 4.6% of submissions**)

⇒ **Excellent Poster Award** at Korean Society for Computational Neuroscience

: Developed novel dual-decision tasks & efficient 2D drift-diffusion models, providing quantitative methods to study the dynamics of flexible routing of information between sensory and motor areas.

- Showed that two simultaneous streams of evidence are acquired in parallel, but accumulated sequentially with intermittent switches
- Developed a method to predict 60% of the experimental conditions, trial-by-trial, which disambiguated serial vs. parallel evidence accumulation models
- Developed efficient 2D drift-diffusion models with ~100x lower time complexity & made analyses feasible

Lee DS, Kang YHR, Ruiz-Lambides A, Higham J (2021), *The observed pattern and hidden process of female reproductive trajectories across the lifespan in a nonhuman primate*. **J Animal Ecology** [2021;00:1-14](https://doi.org/10.1111/1365-2656.13414).

⇒ Impact factor: **5.090**

: Contributed a hidden Markov model that explained the effects of senescence (older age) & frailty (short time-to-death) on fertility.

Kang YHR*, Petzschnr FH*, Wolpert DM, and Shadlen MN (2017), *Piercing of consciousness as a threshold crossing operation*. **Current Biology** 27 (15). doi.org/10.1016/j.cub.2017.06.047

⇒ Impact factor: **10.834**

⇒ Featured in news outlets including [The Independent \(link\)](#)

⇒ According to Altmetric, “Compared to other publications in the same field, this publication is extremely highly cited and has received approximately 14 times more citations than average”

: Developed novel covert decision-making tasks & cross-validation methods for drift-diffusion models, which provided the first external validation of subjective decision times, which had been considered an impasse in the studies of awareness since Libet *et al.* (1983).

Bakkour A, Palombo DJ, Zylberberg A, Kang YHR, Reid A, Verfaellie M, Shadlen MN, and Shohamy D (2019), *The hippocampus supports deliberation during value-based decisions*. **eLife** 8, [e46080](https://doi.org/10.1101/346080).

⇒ Impact factor: **8.140**

: Contributed a perceptual decision-making task, analysis software, and the successful prediction that the hippocampus will be more active during more difficult decisions by engaging in the decision for longer.

Kang YHR*®, Mahr J*®, Nagy M, Andrási K, Csibra G†, Lengyel M† (2019), *Eye movements reflect causal inference during episodic memory retrieval*. *Cognitive Computational Neuroscience (CCN)*. doi.org/10.32470/CCN.2019.1330-0

Lee DS and Kang HR (2012), *The categorization of “bad animal” and its relation to animal appearances: a study of 6-year-old children’s perceptions*. *J Soc, Evol, and Cultural Psy* 6 (1), 32. doi.org/10.1037/h0099226

Yoon S, Jun CS, An HY, Kang HR, Jun TY (2009), *Patterns of temperament and character in patients with PTSD and their association with symptom severity*. *Comprehensive Psychiatry* 50 (3): 226-231. doi.org/10.1016/j.comppsy.2008.08.003

PUBLICATIONS - IN PREP/UNDER REVISION

Kang YHR®, Wolpert DM, Lengyel M, *Spatial uncertainty provides a unifying account of navigation behavior and grid field deformations* ([Bernstein talk video](#)).

⇒ Selected as a **Contributed Talk at Bernstein Conference** in 2021 (**top 3.7% of presentations**)

⇒ Awarded a **Cosyne Presenters Travel Grant** in 2020 (~3% of submissions)

: Developed a unifying normative theory that jointly explains well-known homing behavior & grid field deformations on multiple levels (geometry- / training- / trajectory-dependence).

- Model takes as input the 1st-person view video
- Combined information-theoretic analysis, state-of-the-art robotic navigation algorithm, and large-scale gradient-based optimization

Kang YHR*®, Mahr J*®, Nagy M, Andrási K, Csibra G†, Lengyel M†, *Eye movements reflect causal inference during episodic memory retrieval*.

: Showed that gazes betray subjective uncertainty in causal inference about a false cue during episodic memory retrieval.

Olieslagers J*, Kang YHR*®, Wolpert DM†, Lengyel M†, *Active sensing in landmark-based localisation* ([Bernstein](#)).

: Supervised an Engineering Masters project that involved online psychophysics & ideal observer modeling.

- Writing a manuscript for publication together—an unusual success for a Masters project

Kang YHR, *Modeling a decision based on two simultaneous streams of evidence with graded inhibitory interaction*.

Kang YHR, *Estimation of time-varying decision thresholds from the choice and reaction times without assumptions on the shape*. *bioRxiv*. doi.org/10.1101/090217

COLLABORATORS

Máté Lengyel (University of Cambridge)	normative models of behaviour & neural representation
Guillaume Hennequin (University of Cambridge)	cortical dynamics
Daniel Wolpert (Columbia University)	human sensorimotor control
Michael Shadlen (Columbia University)	decision-making in human & nonhuman primates
Gergely Csibra (CEU & Birkbeck)	human infant & adult eye movements
György Buzsáki & David Tingley (NYU)	electrophysiology of rodents during navigation
Dora Angelaki (NYU)	electrophysiology of nonhuman primates during navigation

FUNDING & AWARDS

2020	Cosyne Presenters Travel Grant , Computational and Cognitive Neuroscience (\$1K)
2019 - 2022	Junior Research Fellow , Wolfson College, University of Cambridge (~ £9K)
2014	Excellent Poster , Korean Society for Computational Neuroscience
2013 - 2016	Trainee , Vision Training Grant, National Eye Institute, USA (~ \$152K)
2009 & 2010	Most Welcoming Centre (among ~20 branches), Incheon Public Health Centre, South Korea
2002 - 2004	Scholarship for tuition , Seoul National University, South Korea (~ \$9K)
2002	Scholarship for overseas studies , Seoul National University, South Korea (~ \$2K)
2002	Case Fellow , Case Inc., South Korea (~ \$1K)
2001	Grand Prize (1st place) , Yonsei National Olympiad in Informatics, South Korea
2001	National Creativity Contest (1st place) , Minister of Education, South Korea

INVITED SEMINARS

2022	World Wide NeuRise (online): https://www.world-wide.org/seminar/8289/
2018	Samsung Seoul Medical Center, South Korea
2017	MIT Brain & Cognitive Sciences, USA
2017	NYU Neural Science, USA
2017	Champalimaud Centre for the Unknown, Portugal
2017	Department of Cognitive Sciences, Seoul National University, South Korea

TRAINEES

2020 - 2021	Jeroen Olieslagers, Department of Engineering, University of Cambridge <ul style="list-style-type: none">• Supervised Masters project• Online psychophysics experiment & ideal observer modeling of active sensing in navigation• Presented a poster at the Bernstein Conference in 2021 (link)• Finished the project from planning to writing a manuscript for publication together in 1 year• Student was admitted to the NYU Neural Science PhD program in 2021
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TEACHING

2020 - present	PhD Mentor, Wolfson College, University of Cambridge Providing pastoral care to new PhD students of the college.
2019 - 2021	Supervisor, Introduction to Neuroscience, University of Cambridge Supervised engineering Masters students on Bayesian decision-making theories.
2020	Assessor, Engineering Masters Project, University of Cambridge Assessed an engineering Masters student's term project on computational neuroscience.
2016	Instructor, Quantitative Approaches for Experimental Neuroscientists, Columbia University Gave a lecture in a graduate course on computational theories of decision making.
2013 - 2014	Founder, Workshops on Modeling Drift-Diffusion Processes, Shadlen Lab, Columbia University Initiated and led hands-on workshops; taught the theory of the drift-diffusion model of decision-making to graduate students and postdocs, and helped them implement it with MATLAB.

SOFTWARE

- 2021 Two-Dimensional Drift-Diffusion Models
Wrote a library in MATLAB & Python (PyTorch) to fit choice & reaction time in controlled-duration & reaction time experiments given two simultaneous streams of evidence.
- **Parametrically interpolates between serial & parallel models of evidence accumulation**
 - Validated through model/parameter recovery (simulation) & cross-validation (real data)
 - Fit to 40% of experimental conditions and **predict unseen conditions (60% of all conditions)**
 - https://github.com/yulkang/2D_Decision - accompanies [Kang et al. \(2021\) eLife](#)
- 2019 ConsTorch: Automatic Transformation-Based Parameter Constraints for PyTorch
Wrote a library to automatically constrain PyTorch parameters.
- <https://github.com/yulkang/constorch>
- 2017 One-Dimensional Drift-Diffusion Models
Wrote a library to fit choice & reaction time in controlled-duration & reaction time experiments.
- **Predict choices with a model fitted only with reaction times/subjective decision times**
 - Validated through parameter recovery (simulation) & cross-validation (real data)
 - Estimates the posterior distribution of the parameters through MCMC
 - <https://github.com/yulkang/SubjDecTime> - accompanies [Kang et al. \(2017\) Current Biology](#)

POSTERS & PRESENTATIONS

- Kang YHR, Wolpert DM, and Lengyel M (2021), Spatial uncertainty provides a unifying account of navigation behavior and grid field deformations, Bernstein Conference in Computational Neuroscience, Online.
***Selected as a Contributed Talk (~3% of all presentations)**
- Kang YHR, Wolpert DM, and Lengyel M (2021), An image-computable ideal observer model of navigation explains homing behavior and grid/place field deformation, Computational and Systems Neuroscience Conference (Cosyne), Online.
- Kang YHR, Wolpert DM, and Lengyel M (2020), Navigational uncertainty provides a unifying account of human navigational behavior and rodent grid field deformations, Computational and Systems Neuroscience Conference (Cosyne), Denver, CO, USA.
***Cosyne Presenters Travel Grant**
- Kang YHR, Wolpert DM, and Lengyel M (2019), Simultaneous Localization And Mapping in People, Computational Vision Summer School (CVSS), Black Forest, Germany. **Acceptance rate: 13.4%**
- Kang YHR, Wolpert DM, and Lengyel M (2019), Confirmation bias trumps performance optimisation in overt active learning, Annual Meeting of the Cognitive Science Society (CogSci), Montreal, Canada.
- Kang YHR, Wolpert DM, and Lengyel M (2019), Confirmation bias in active learning, Computational and Systems Neuroscience Conference (Cosyne), Lisbon, Portugal. **Acceptance rate: 35%**
- Kang YHR, and Shadlen MN (2014), Making one decision from two simultaneous sources of evidence, The 6th Annual Meeting of Korean Society for Computational Neuroscience, Seoul, South Korea.
***Excellent Poster Award**

VOLUNTEER & EXTRACURRICULAR ACTIVITIES

- 2019 - present Governing Body Fellow, Wolfson College & University of Cambridge
Serving as a member to decide on matters of governance of the college & the university.
- 2020 - present Fine Arts Committee, Wolfson College, University of Cambridge
Serving on the college's committee overseeing matters regarding fine arts, including exhibitions at the college.
- 2019 Artist, "Home" Art Exhibition, Michaelhouse Centre, Cambridge Convoy Refugee Action Group
Accepted through a competition, exhibited two pieces of painting in a group exhibition to help refugees and homeless people. <http://camcrag.org.uk/homeart/>
- 2017 Invited Speaker, Harlem Academy (middle school), New York, NY
Performed a cognitive experiment (Stroop Effect) together, which led to poster presentations