

Bochang Moon

Associate Professor

School of Integrated Technology at Gwangju Institute of Science and Technology (GIST)

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Education

- **Ph.D.** in Computer Science, KAIST, Korea Feb. 2010 – Aug. 2014
Thesis: acceleration techniques for monte carlo ray tracing
Advisor: Sung-Eui Yoon
- **M.S.** in computer science at KAIST, Korea Feb. 2008 – Jan. 2010
Thesis: cache-oblivious ray reordering
Advisor: Sung-Eui Yoon
- **B.S.** in computer engineering at Chung-Ang university, Korea Mar. 2004 – Feb. 2008
Graduated top of the college of engineering (GPA: 4.35/4.50)

Professional Experience

- **Associate Professor**, Gwangju Institute of Science and Technology Feb. 2022 – present
- **Assistant Professor**, Gwangju Institute of Science and Technology Sep. 2016 – Feb. 2022
- **Post Doc**, Disney Research Zürich (based on Edinburgh) Nov. 2014 – July 2016
- **Post Doc**, Dept. of computer science, KAIST Sep. 2014 – Oct. 2014
- **Research Intern**, Adobe, US Jun. 2011 – Sep. 2011
- **Research Assistant**, Scalable Graphics/Geometric Algorithm Lab., KAIST Feb. 2008 – Aug. 2014
- **Teaching Assistant**, Dept. of computer science, KAIST Feb. 2009 – Jan. 2011

Research Interests

- Photorealistic rendering
- Monte Carlo ray tracing
- AI + rendering
- Augmented and virtual reality

Awards

- Best Paper Award at SIGGRAPH Asia 2022
 - Related work: Neural James-Stein Combiner for Unbiased and Biased Renderings
- Best Teacher Award at GIST 2021

Curriculum Vitae (Bochang Moon)

- Best Paper Honorable Mention Award at Pacific Graphics 2018
 - Related work: Feature Generation for Adaptive Gradient-Domain Path Tracing
- Significant New Researcher Award at Korea Computer Graphics Society (KCGS) 2014
- 3rd place at ACM Student Research Competition (SRC) grand finals held at the ACM awards banquet
1st place at ACM SRC held at ACM SIGGRAPH 2009
 - Related work: RACBVHs: Random-Accessible Compressed Bounding Volume Hierarchies

Publications (International Conference / Journal Papers)

1. **Enhanced Direct Lighting Using Visibility-Aware Light Sampling**
Geonu Noh, Hajin Choi, [Bochang Moon](#)
Accepted to the Computer Graphics International (CGI), LNCS track
2. **Adaptively weighted discrete Laplacian for inverse rendering**
Hyeonjang An, Wonjun Lee, [Bochang Moon](#)
Accepted to The Visual Computer (Proceedings of the Computer Graphics International), Visual Computer track
3. **Robust Image Denoising of No-Flash Images Guided by Consistent Flash Images**
Geunwoo Oh, Jonghee Back, Jae-Pil Heo, [Bochang Moon](#)
Proceedings of the AAAI Conference on Artificial Intelligence (AAAI), 37(2), pp. 1993-2001, Jun 2023 [oral presentation]
4. **Neural James-Stein Combiner for Unbiased and Biased Renderings**
Jeongmin Gu, Jose A. Iglesias-Guitian, [Bochang Moon](#)
ACM Transactions on Graphics (Proceedings of SIGGRAPH Asia 2022), 41(6), pp. 262:1-262:14, Dec 2022
*Received **Best Paper Award** at SIGGRAPH Asia 2022*
5. **Online Illumination Learning for Interactive Global Illumination in Augmented Reality**
Wonjun Lee, Piljoong Jeong, Hajin Choi, Jinwoo Kim, [Bochang Moon](#)
IEEE Access, vol. 10, pp. 109498-109509, Oct 2022
6. **Self-Supervised Post-Correction for Monte Carlo Denoising**
Jonghee Back, Binh-Son Hua, Toshiya Hachisuka, [Bochang Moon](#)
Proceedings of ACM SIGGRAPH 2022, pp. 18:1-18:8, July 2022
7. **Real-Time Denoising of Volumetric Path Tracing for Direct Volume Rendering**
Jose A. Iglesias-Guitian, Prajita Mane, [Bochang Moon](#)
IEEE Transactions on Visualization and Computer Graphics (TVCG), vol. 28, no. 7, pp. 2734-2747, July 2022
8. **Projector Compensation Framework Using Differentiable Rendering**
Jino Park, Donghyuk Jung, [Bochang Moon](#)
IEEE Access, 10, pp. 44461 - 44470, April 2022

--- Promoted to an associate professor ---
9. **Consistent Post-Reconstruction for Progressive Photon Mapping**
Hajin Choi, [Bochang Moon](#)
Computer Graphics Forum (Proceedings of Pacific Graphics 2021), vol. 40, no. 7, pp. 121-130, Oct. 2021
10. **Similar Patch Selection in Embedding Space for Multi-View Image Denoising**

Geunwoo Oh, Dong-Wan Choi, [Bochang Moon](#)

IEEE Access, 9, pp. 98581 - 98589, July 2021

11. Deep combiner for independent and correlated pixel estimates

Jonghee Back, Binh-Son Hua, Toshiya Hachisuka, [Bochang Moon](#)

ACM Transactions on Graphics (Proceedings of SIGGRAPH Asia 2020), vol. 39, no. 6, pp. 242:1 – 242:12, Nov. 2020

12. Adaptive kernel inference for dense and sharp occupancy grids

Youngsun Kwon, [Bochang Moon](#), Sung-Eui Yoon

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2020

13. Gradient outlier removal for gradient-domain path tracing

Saerom Ha, Sojin Oh, Jonghee Back, Sung-Eui Yoon, [Bochang Moon](#)

Computer Graphics Forum (Proceedings of Eurographics 2019), vol. 38, no. 2, pp. 245-253, Jun. 2019

14. Feature generation for adaptive gradient-domain path tracing

Jonghee Back, Sung-Eui Yoon, [Bochang Moon](#)

Computer Graphics Forum (Proceedings of Pacific Graphics 2018), vol. 37, no.7, pp. 65-74, Oct. 2018

Received *Best Paper Honorable Mention Award* at Pacific Graphics 2018

15. Noise reduction on G-buffers for Monte Carlo filtering

[Bochang Moon](#), Jose A Iglesias-Guitian, Steven McDonagh, Kenny Mitchell

Computer Graphics Forum (Presented at Eurographics Symposium on Rendering (EGSR) 2017), vol. 36, no. 8, pp. 600-612, Dec. 2017

--- Joined GIST ---

16. Pixel history linear models for real-time temporal filtering

Jose A Iglesias-Guitian, [Bochang Moon](#), Charalampos Koniaris, Eric Smolikowski, Kenny Mitchell

Computer Graphics Forum (Proceedings of Pacific Graphics 2016), vol. 35, no. 7, pp. 363-372, Oct. 2016

17. Nonlinearly weighted first-order regression for denoising Monte Carlo renderings

Benedikt Bitterli, Fabrice Rousselle, [Bochang Moon](#), Jose A. Iglesias-Guitian, David Adler, Kenny Mitchell, Wojciech Jarosz, Jan Novak

Computer Graphics Forum (Proceedings of Eurographics Symposium on Rendering (EGSR) 2016), vol. 35, no. 4, July 2016

18. User, metric, and computational evaluation of foveated rendering methods

Nicholas T. Swafford, Charalampos Koniaris, Jose A. Iglesias-Guitian, [Bochang Moon](#), Darren Cosker, Kenny Mitchell

Proceedings of ACM Symposium on Applied Perception, July 2016

19. Adaptive polynomial rendering

[Bochang Moon](#), Steven McDonagh, Kenny Mitchell, Markus Gross

ACM Transactions on Graphics (Proceedings of SIGGRAPH 2016), vol. 35, no. 4, pp. 40:1-40:10, July 2016

20. Adaptive rendering with linear predictions

[Bochang Moon](#), Jose A. Iglesias-Guitian, Sung-Eui Yoon, Kenny Mitchell

ACM Transactions on Graphics (Proceedings of SIGGRAPH 2015), vol. 34, no. 4, pp. 121:1-121:11, Aug. 2015

21. Recent advances in adaptive sampling and reconstruction for Monte Carlo rendering

Matthias Zwicker, Wojciech Jarosz, Jaakko Lehtinen, [Bochang Moon](#), Ravi Ramamoorthi, Fabrice Rousselle, Pradeep Sen, Cyril Soler, Sung-Eui Yoon

Curriculum Vitae (Bochang Moon)

Computer Graphics Forum (Proceedings of Eurographics 2015), vol. 34, no. 2, pp. 667-681, May 2015

--- Became a Ph.D. ---

22. Adaptive rendering based on weighted local regression

Bochang Moon, Nathan Carr, Sung-Eui Yoon

ACM Transactions on Graphics (Presented at SIGGRAPH 2015), vol. 33, no. 5, pp. 170:1-170:14, Aug. 2014

23. P-RPF: pixel-based random parameter filtering for Monte Carlo rendering

Hyosub Park, Bochang Moon, Soomin Kim, Sung-Eui Yoon

Proceedings of Computer-Aided Design and Computer Graphics (CAD/Graphics), pp. 123 - 130, Nov. 2013

24. Robust image denoising using a virtual flash image for Monte Carlo ray tracing

Bochang Moon, Jong Yun Jun, JongHyeob Lee, Kunho Kim, Toshiya Hachisuka, Sung-Eui Yoon

Computer Graphics Forum (Presented at Eurographics Symposium on Rendering (EGSR) 2014), vol. 32, No. 1, pp. 139-151, Feb. 2013

25. Cache-oblivious ray reordering

Bochang Moon, Youngyong Byun, Tae-Joon Kim, Pio Claudio, Hye-sun Kim, Yun-ji Ban, Seung Woo Nam, Sung-Eui Yoon

ACM Transactions on Graphics (Presented at SIGGRAPH 2011), vol. 29, no. 3, pp. 28:1-28:10, June 2010

26. HCCMeshes: hierarchical-culling oriented compact meshes

Tae-Joon Kim, Yongyoung Byun, Yongjin Kim, Bochang Moon, Seungyong Lee, Sung-Eui Yoon

Computer Graphics Forum (Proceedings of Eurographics 2010), vol. 29, no. 2, pp. 299-308, May 2010

27. RACBVHs: random-accessible compressed bounding volume hierarchies

Tae-Joon Kim, Bochang Moon, Duksu Kim, Sung-Eui Yoon

IEEE Transactions on Visualization and Computer Graphics (TVCG), vol. 16, no. 2, pp. 273-286, Mar. 2010

Presentations (Short Papers/Posters/Exhibitions)

1. Interactive ray-traced area lighting with adaptive polynomial filtering

Jose A. Iglesias Guitian, Bochang Moon, Kenny Mitchell

The 13th European Conference on Visual Media Production (CVMP), London, 2016

2. IRIDiuM: immersive rendered interactive deep media

Babis Koniaris, Maggie Kosek, Ivan Huerta, Karen Darragh, Charles Malleson, Joanna Jamrozny, Nick Swafford, Jose A. Iglesias Guitian, Bochang Moon, Ali Israr, Kenny Mitchell

VR Village in SIGGRAPH 2016

Domestic Publications

1. SURE-based-trous wavelet filter for interactive Monte Carlo rendering

Soomin Kim, Bochang Moon, Sung-Eui Yoon

Journal of KIISE, vol. 43, no. 8, pp. 835-840, Aug. 2016

Patents (registered)

1. Apparatus for enhancing Image quality, and method for the same

Curriculum Vitae (Bochang Moon)

(이미지 품질향상장치, 이미지 품질향상방법)

Bochang Moon, Jonghee Back

Registration #: 1023396190000, Korea, Dec. 10, 2021

2. Method and Apparatus for Adaptive Kernel Inference for Dense and Sharp Occupancy Grids

(정밀 점유 지도 작성을 위한 적응형 커널 추론 방법 및 장치)

Sung-Eui Yoon, Bochang Moon, Youngsun Kwon

Registration #: 1023190150000, Korea, Oct. 25, 2021

3. Denoising method in image processing device and method for generating feature therefor

(이미지 처리 장치의 디노이징 방법 및 이를 위한 피처 생성 방법)

Jonghee Back, Sung-Eui Yoon, Bochang Moon

Registration #: 1021354590000, Korea, July 13, 2020

4. Noise reduction on G-buffers for Monte Carlo filtering

Kenneth Mitchell, Jose A Iglesias-Guitian, Bochang Moon, Steven McDonagh

Registration #: 10403026, US, Sep. 12, 2019

5. System and method of presenting views of a virtual space

Kenneth Mitchell, Charalampos Koniaris, Jose A Iglesias-Guitian, Bochang Moon, Eric Smolikowski

Registration #: 09996949, US, June 12, 2018

6. Adaptive polynomial rendering

Bochang Moon, Markus Gross, Steven McDonagh, Kenneth Mitchell

Registration #: 09959664, US, May 01, 2018

7. Adaptive rendering with linear predictions

Kenneth Mitchell, Bochang Moon, Jose A Iglesias-Guitian

Registration #: 9892549, US, Feb. 13, 2018

8. Adaptive sampling guided by multilateral filtering

Bochang Moon, Nathan Carr

Registration #: 08824834, US, Sep. 02, 2014

9. Method for removing image noise on basis of stochastic rendering

Sung-Eui Yoon, Bochang Moon, Kunho Kim, Jong Yun Jun, Jong Hyeob Lee

Publication #: WO/2013/137522, PCT, Sep. 19, 2013

10. Noise reduction method for stochastic rendering image

(확률적 렌더링에 따른 이미지의 잡음 제거 방법)

Sung-Eui Yoon, Bochang Moon, Kunho Kim, Jong Yun Jun, Jong Hyeob Lee

Registration #: 1012827000000, Korea, July 01, 2013

Professional Activities

➤ Editorial board member

- Visual Computer, Sep. 2016 - present
- (Domestic) Journal of KCGS: Mar. 2020 – present
- (Domestic) Smart Media Journal, Jan. 2018 - Dec. 2019

Curriculum Vitae (Bochang Moon)

➤ Program committee member

- ACM SIGGRAPH Asia (Technical Communications and Posters): 2020
- Eurographics Symposium on Rendering (EGSR): 2017 - 2019
- ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games (I3D): 2018 – 2019
- Pacific Graphics (PG): 2019, 2022
- Computer Graphics International (CGI): 2018 - 2023
- Graphics Interface (GI): 2022 - 2023
- AAAI: 2023
- (Domestic) KCGS: 2017, 2018

➤ Reviewer

- ACM SIGGRAPH, ACM SIGGRAPH ASIA, ACM Transactions on Graphics, IEEE TVCG, Eurographics, Pacific Graphics, Visual Computer, IEEE VR, etc.

Press Release

- “GIST, 인공지능경망 이미지 기술로 시그래프 최우수 논문상 수상”
 - AI 타임스, Dec. 20, 2022, <https://www.aitimes.com/news/articleView.html?idxno=148541>
- “Researchers from Gwangju Institute of Science and Technology Develop a New Method for Denoising Images”
 - Eurekalert, Sep. 19, 2022, <https://www.eurekalert.org/news-releases/965132>
- “Disney Research rendering method preserves detail in film quality production graphics”
 - Phys, Aug. 5, 2015, <http://phys.org/news/2015-08-team-method-quality-production-graphics.html>
- “Adaptive rendering method reduces discolored pixels in photo-realistic images”
 - Phys, July 20, 2016, <https://phys.org/news/2016-07-method-discolored-pixels-photo-realistic-images.html>

Research Grants / Contracts (only external)

Ongoing projects

1. Deep Learning based Denoising with Imperfect Dataset for Photorealistic Rendering
(불완전한 데이터셋을 이용한 실사 렌더링 이미지의 디러닝 기반 잡음제거)
 - 2023.03– 2026.02, PI, NRF, approximately 425M won (\$425K)
2. On practical rendering research (details will be given when necessary)
 - 2022.08– 2023.07, PI, Samsung
3. Optimization for learning-based novel-view synthesis using graphics techniques
(컴퓨터 그래픽스 기법을 활용한 디러닝 기반 시점 합성 기술 고속화 방안 연구)
 - 2022.05– 2024.12, PI, ETRI, 180M won (\$180K)
4. The development of object media technology based on multiple video sources
(다중 소스 영상의 객체 미디어 처리 기술 개발)
 - 2022.04– 2025.12, MSIT/IITP, 730M won (\$730K)

Curriculum Vitae (Bochang Moon)

5. Development of Space-telling Design Tool and Platform based on Art Museum XR Twin for Supporting Exhibition Planning

(미술관 XR 트윈 기반 전시기획 지원 스페이스텔링 저작도구 및 플랫폼 기술 개발)

- 2021.07 – 2023.12, PI, MCST/KOCCA, 520M won (\$520K)

Past projects

6. Denoising for photorealistic rendering with correlated sampling

(상관된 샘플링을 활용하는 실사 렌더링을 위한 잡음제거)

- 2020.03 – 2023.02, PI, NRF, 450M won (\$450K)

7. Development of intelligent agent-based smart stage exhibition dynamic space cognitive mediawall platform technology

(인텔리전트 에이전트 기반 스마트 무대전시 동적 공간 인지형 미디어월 플랫폼 기술 개발)

- 2020.06 – 2022.12, MCST/KOCCA, 300M won (\$300K)

8. Development of AI technology to generate and validate the task plan for assembling furniture in the real and virtual environment by understanding the unstructured multi-modal information from the assembly manual

(조립 설명서로부터 비정형 멀티 모달 정보를 이해하여 실·가상환경에서 가구조립을 위한 작업 계획을 생성·검증하는 AI 기술 개발)

- 2019.04-2020.12, NIPA, 230M won (\$230K)

9. Development of multi-dimensional imaging technology and platform for performance immersion

(공연 몰입형 감상을 위한 다차원 영상 촬영 기술 및 플랫폼 연구개발)

- 2018.04-2020.12, MCST/KOCCA, 112M won (\$112K)

10. Real-time 4D reconstruction of dynamic objects for ultra-realistic service

(초실감 서비스를 위한 동적 객체의 실시간 4D 복원 기술 개발)

- 2018.01-2020.12, PI, MSIT - Giga Korea Project, 535M won (\$535K)

11. Photo-realistic rendering in augmented reality

(실사 렌더링 기반 증강 현실)

- 2017.12-2020.11, PI, Samsung, 450M won (\$450K)

12. Denoising for Physically based Rendering

(물리 기반 렌더링을 위한 잡음 제거)

- 2017.03 – 2020.02, PI, NRF, 301M won (\$301K)

13. Developed intelligent UX/UI technology for AR glasses-based docent operation

(AR 글래스 기반 도슨트 운용을 위한 지능형 UI/UX 기술 개발)

- 2017.04 – 2017.12, MCST/KOCCA, 30M won (\$30K)

Teaching

- Advanced Photorealistic Rendering (3 credits)

Curriculum Vitae (Bochang Moon)

- Fall 2022
- Computer Graphics & Applications (3 credits)
 - Fall 2019
- Computer Graphics (3 credits)
 - Spring 2017, Spring 2018, Spring 2019, Spring 2020, Spring 2021, Spring 2022, Spring 2023
- Photorealistic Rendering (3 credits)
 - Fall 2017, Fall 2018, Fall 2020, Fall 2021
- Culture Technology Program Seminar (1 credit)
 - Spring 2017, Fall 2017, Spring 2018, Spring 2021, Fall 2021
- Character Design, Animation, and Rendering (KMOOC course)
 - 2017

Supervised Students (ongoing)

- PhD Candidates (or M.S./Ph.D. Integrated Course)
 - Wonjoon Lee (이원준, 2018.03 – present)
 - Geunwoo Oh (오근우, 2018.02 – present)
 - Hajin Choi (최하진, 2018.03 - present)
 - Donghun Shin (신동훈, 2018.03 – present)
 - JongHee Back (백종희, 2019.09 – present)
 - JungMin Goo (구정민, 2020.03 – present)
 - GeonU Noh (노건우, 2020.03 – present)
 - Chanu Yang (양찬우, 2022.02 – present)
 - Woochan Sun (선우찬, 2023.03 – present)
- MS Candidates
 - Jongbeom Ryu (류종범, 2022.02 – present)
 - Yewon Cho (조예원, 2023.03 – present)

Supervised Students (previously)

- PhD students
- MS students
 - Yunha Sohn (손윤하, 2021.09 – 2023.08)
 - Hyeonjang An (안현장, 2021.02 – 2023.02)
 - Donghyuk Jung (정동혁, 2021.02 – 2023.02)
 - Jino Park (박진오, 2019.09 – 2022.02)
 - Piljoon Jeong (정필중, 2017.09 – 2022.02)

Curriculum Vitae (Bochang Moon)

- Saerom Ha (하세롬, 2017.03 – 2019.02)
- Sojin Oh (오소진, 2017.08 – 2019.02)
- Prajita Mane (2017.09 – 2019.08)
- JongHee Back (백종희, 2018.03 – 2019.08)
- JungMin Goo (구정민, 2018.03 – 2020.02)
- Junyoung Park (박준영, 2019.03 – 2020.08)

References

Available upon request.