Vinh Van Duong

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SUMMARY

My primary research goal is to develop more cost-efficient ways for light field (LF) coding and enhancement frameworks. Specifically, I am interested in developing algorithms that apply deep learning (DL) to LF video coding and restoration paradigms.

Additionally, I have a keen interest in various other topics, such as unsupervised image denoising, single image super-resolution, and depth estimation, and I am continually exploring new research topics. I am actively looking for opportunities as a deep learning researcher to apply unsupervised/supervised or generative learning to video coding and image restoration framework.

EDUCATION

Sungkyunkwan University (SKKU)

Suwon, Korea
9/2017-6/2023

Ph.D. in Electrical and Electronic Engineering

- Thesis title: Compression and restoration for light field data

- Advisor: Prof. Byeungwoo Jeon

Hanoi University of Science and Technology (HUST)

Hanoi, Vietnam
9/2012-6/2017

B.Eng. in Electrical and Electronic Engineering

- Thesis title: Efficient time domain chanel estimation for LTE-R systems

- Advisor: Prof. Van Duc Nguyen

RESEARCH EXPERIENCE

Digital Media Lab, Sungkyunkwan University (SKKU)

Suwon, Korea
9/2017-present

Research assistant

- **Research on light field video compression and restoration methods**

- **Achievements:**

  - Proposed a deep learning based super-resolution method for light field image

    * *Proposed a novel CNN network for light field image super-resolution*

    * *Achieved 2nd ranking on light field super-resolution challenge in CVPR 2023*

  - Proposed a deep learning based denoising method for light field image

    * *Proposed a hybrid CNN network for light field image denoising*

    * *Exploiting the sparsity in deep light field image denoising based 4D-DCT Separated Transform*

  - Proposed a fast motion estimation for light field video compression

    * *The proposed fast search pattern was designed based on new observation of unique motion distribution of new light field camera*

    * *Achieved the best trade-off between performance and complexity compared to existing methods in MPEG-Immersive standardization*

Wireless Communication Lab, Hanoi University of Science and Technology (HUST)

Hanoi, Vietnam
9/2015-6/2017

Research assistant

- **Research on channel estimation method for high-speed railway based on LTE-R system**

- **Achievements:**

  - Proposed a new pilot structure for time domain channel estimation

  - Improved the channel estimation based on learning method

Selected Projects

Light field video compression and enhancement towards immersive media applications
Funded by National Research Foundation of Korea (NRF)
3/2023-2/2026
(on going project)

- **Main Role:** I led a research team in my lab and developed cutting-edge technologies to design realistic compression and enhancement techniques for immersive light field media applications. We especially focus on applying deep learning to light field compression frameworks, such as neural radiance field based end-to-end learning for LF compression framework. Besides, I am actively contributing to the technical proposal on the MPEG-Immersive standardization working with lenslet light field video coding.

Development of super-pixel based light field compression and enhancement
Funded by National Research Foundation of Korea (NRF)
3/2020-2/2023

- **Main Role:** I developed an innovative super-resolution based deep learning method, which is published in the top-tier computational imaging journal (IEEE Transactions on Computational Imaging). Moreover, this method achieves 2nd ranking on light field super-resolution in CVPR 2023. This project showcased my expertise in computer vision and deep learning. Currently, I am studying more advanced techniques based on the generative deep learning method, which brings a new solution to enhance the resolution of light field data for immersive applications.

Multi-functional Imaging and its Applications
Funded by National Research Foundation of Korea (NRF)
3/2020-2/2023

- **Main Role:** Refocusing after the captured image is one of the most interesting functionalities of light field images. In this project, I delivered a simple architecture for light field compression-based refocusing applications. Besides, I proposed a robust light field depth estimation with the occlusion method.

Development of a channel estimation method for high-speed railway based on LTE-R system
Funded by National Foundation for Science and Technology Development of Vietnam (NAFOSTED)
9/2015-6/2017

- **Main Role:** Led a group of 3 students to design a channel estimation-based LTE-R platform. Our team proposed a new pilot structure for time domain channel estimation based on a learning-based method.

Honors And Awards

- 2nd ranking on CVPR 2023 light field super-resolution challenges — *3/2023*
- SKKU Graduate School Innovation Specialization Scholarship — *5/2023*
- Travel funds for exchange study in Osaka University, Japan — *2/2020*
- Best paper ward in IWAIT 2020 — *1/2020*
- First prize on student scientific research contest in HUST — *5/2017*

Activities

- **Reviewer for the following journals:**

  - IEEE Transactions on Circuits and Systems for Video Technology
  - IEEE Access
  - Elsevier Display

- **Reviewer for the following conferences:**

  - IEEE International Conference on Advanced Technologies for Communications (ATC)
  - IEEE International Conference on Communications and Electronics (ICCE)

- **Member of IEEE Young Professionals**

Technical Skills

- **Program Languages:** Matlab, C/C++, Python

- **Frameworks:** PyTorch, TensorFlow, Keras, OpenCV

Languages

- Vietnamese (Mother tongue)

- English (Advanced)

- Korean (Beginner)

References

- **Professor Byeungwoo Jeon**

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  - Phone: +82-31-290-7144

- **Professor Van Duc Nguyen**

  - Address: School of Electronics and Telecommunication, Hanoi University of Science and Technology (HUST), Vietnam
  - Email: nguyenvanduc1305@gmail.com
  - Phone: +84-98-224-4811

Publication

- **Preprint**

[1] **Vinh Van Duong**, Thuc Huu Nguyen, Jonghoon Yim, and Byeungwoo Jeon, MCPS2.0: Fast and Efficient Macropixel Collocated Position Search for Plenoptic 2.0 Video Coding, under preparation to *IEEE Trans. on Circuits and Systems for Video Technology.*

[2] **Vinh Van Duong**, Thuc Huu Nguyen, Jonghoon Yim, and Byeungwoo Jeon, Fast and Efficient Template Matching for Plenoptic Video Coding, under preparation to *IEEE Trans. Broadcasting.*

[3] **Vinh Van Duong**, Thuc Huu Nguyen, Jonghoon Yim, and Byeungwoo Jeon, Exploiting the Sparsity in Deep Light Field Image Denoising based 4D-DCT Separated Transform , under preparation to *IEEE Trans. on Computational Imaging.*

- **Journal papers**

[1] **Vinh Van Duong**, Thuc Huu Nguyen, Jonghoon Yim, and Byeungwoo Jeon, Light Field Image Super-Resolution Network via Joint Spatial-Angular and Epipolar Information, *IEEE Trans. on Computational Imaging*, vol. 09, pp. 350 366, 2023.

[2] **Vinh Van Duong**, T. N. Canh, Thuc Huu Nguyen, and Byeungwoo Jeon, Focal stack based light field coding for refocusing applications, *Journal of Broadcast Engineering* , vol. 24, no. 7, pp. 1246-1258, 2019.

[3] Thuc Huu Nguyen, **Vinh Van Duong**, Jonghoon Yim, and Byeungwoo Jeon, Ray-space motion compensation for lenslet plenoptic video coding, *IEEE Trans. Image Process.*, vol. 32, pp. 12151230, 2023.

[4] J.-K. Choi, V. D. Nguyen, H. N. Nguyen, **Vinh Van Duong**, T. H. Nguyen, H. Cho, H.-K. Choi, and S.-G Park, A time-domain estimation method of rapidly time-varying channels for OFDM-based LTE-R systems, *Digital Communications and Networks*, vol. 5, no. 2, pp. 94101, 2019.

[5] V. D. Nguyen, D. V. Ha, **Vinh Van Duong**, H. A. Le, and T. H. Nguyen, Joint fast time domain channel estimation with ICI cancellation for LTE-R systems, *Physical Communication.*, vol. 47, no. 101349, p. 101349, 2021.

- **Conference papers**

[1] **Vinh Van Duong**, T. N. Huu, J. Yim, and B. Jeon, Adaptive Search Range for Template Matching forPlenoptic Video Coding under Microlensing Constraints, in IEEE International Symposium on Broadband Multimedia Systems and Broadcasting (BMSB), 2023.

[2]**Vinh Van Duong**, T. N. Huu, J. Yim, and B. Jeon, End-to-end learned light field image rescaling using joint spatial-angular and epipolar information, in IEEE International Conference on Image Processing (ICIP), 2023.

[3] **Vinh Van Duong**, T. N. Huu, J. Yim, and B. Jeon, Downsampling Based Light Field Video Coding With Restoration Network Using Joint Spatio Angular And Epipolar Information, in IEEE International Conference on Image Processing (ICIP), 2022.

[4] **Vinh Van Duong**, T. N. Canh, T. N. Huu, and B. Jeon, LFDeNet: Light Field Depth Estimation Network Based on Hybrid Data Representation, in IEEE International Symposium on Broadband Multimedia Systems and Broadcasting (BMSB), 2022.

[5]**Vinh Van Duong**, T. N. Huu, J. Yim, and B. Jeon, A fast and efficient super-resolution network using hierarchical dense residual learning, in IEEE International Conference on Image Processing (ICIP), 2021.

[6] **Vinh Van Duong**, T. N. Huu, and B. Jeon, Robust light field depth estimation with occlusion based on spatial and spectral entropies data costs, in IEEE International Conference on Image Processing (ICIP), 2020.

[7] **Vinh Van Duong**, T. N. Canh, T. N. Huu, and B. Jeon, Focal stack based light field coding for refocusing applications, in 2019 IEEE International Symposium on Broadband Multimedia Systems and Broadcasting (BMSB), 2019.

[8] **Vinh Van Duong**, T. Nguyen Canh, and B. Jeon, Light field image coding for efficient refocusing, in 2018 IEEE 12th International Symposium on Embedded Multicore/Many-core Systems-on-Chip (MCSoC), 2018.

[9] **Vinh Van Duong**, T. Nguyen Huu, and B. Jeon, Comparison of data costs for depth estimation from compressed light field images, in International Workshop on Advanced Imaging Technology (IWAIT) 2020, 2020.

[10] **Vinh Van Duong**, T. N. Huu, J. Yim, and B. Jeon, Extended Largest CU size for Intra Block Copy for Plenoptic Video Compression, in 3DSA, 2021.

[11] T. Nguyen Canh,**Vinh Van Duong**, and B. Jeon, Boundary handling for video-based light field coding with a new hybrid scan order, in International Workshop on Advanced Image Technology (IWAIT) 2019, 2019.

[12] T. Nguyen Huu, **Vinh Van Duong**, and B. Jeon, Random-access-aware light field video coding using tree pruning method, in 2020 IEEE International Conference on Visual Communications and Image Processing (VCIP), 2020.

[13] T. N. Huu, **Vinh Van Duong**, and B. Jeon, FAST and efficient microlens-based motion search for plenoptic video coding, in 2021 IEEE International Conference on Image Processing (ICIP), 2021.

[14] Jonghoon Yim, **Vinh Van Duong**, Thuc Nguyen Huu, Byeungwoo Jeon, Enhancing angular resolution using layers obtained from light field superpixel segmentation, in International Workshop on Advanced Image Technology (IWAIT), 2022.

[15] Jonghoon Yim, **Vinh Van Duong**, Thuc Nguyen Huu, Byeungwoo Jeon, Time complexity reduction on light-field super-resolution with graph-based regularization, in International Workshop on Advanced Image Technology (IWAIT), 2022.

[16] Thuc Nguyen Huu,**Vinh Van Duong**, Byeungwoo Jeon, Performance analysis on prediction structure for multi-view-based light field video coding, in International Workshop on Advanced Image Technology (IWAIT), 2022.

[17] Jonghoon Yim, **Vinh Van Duong**, Thuc Nguyen Huu, Byeungwoo Jeon, Enhancing angular resolution using layers obtained from light field superpixel segmentation, in International Workshop on Advanced Image Technology (IWAIT), 2023.

[18] Yuduo Zhang, **Vinh Van Duong**, Jonghoon Yim, Byeungwoo Jeon, Light field image super-resolution using selective kernel convolution, in International Workshop on Advanced Image Technology (IWAIT), 2023.

[19] **Vinh Van Duong**, T. N. Huu, J. Yim, and B. Jeon, Light Field Image Compression using Versatile Video Coding Intra Prediction , in Proceedings of the Korean Society of Broadcast Engineers Conference, 2019.

[20] **Vinh Van Duong**, T. N. Huu, J. Yim, and B. Jeon, Comparison of Quality Metrics of Perspective and Refocused Images in Light Field Images, in Proceedings of the Korean Society of Broadcast Engineers Conference, 2019.

[21] T. N. Huu , **Vinh Van Duong**, and B. Jeon, Analysis of Affine Motion Compensation for Light Field Image Compression, in Proceedings of the Korean Society of Broadcast Engineers Conference, 2019.

[2] Jonghoon Yim, **Vinh Van Duong**, Thuc Nguyen Huu, Byeungwoo Jeon, Improving View-consistency on 4D Light Field Superpixel Segmentation, in Proceedings of the Korean Society of Broadcast Engineers Conference, 2021.

[23] Jonghoon Yim, **Vinh Van Duong**, Thuc Nguyen Huu, Byeungwoo Jeon, Angular Super Resolution of Light Field Image using Graph-based Optimization, in Proceedings of the Korean Society of Broadcast Engineers Conference, 2020.