

# Mathias Unberath

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CONTACT INFORMATION    [Computational Sensing + Robotics](#)    *Voice:* +1 (667) 207-1076  
[Johns Hopkins University](#)    *Fax:* +1 (410) 516-2913  
3400 North Charles Street    *Mail:* [unberath@jhu.edu](mailto:unberath@jhu.edu)  
Baltimore, MD 21218    *Web:* [mathiasunberath.github.io/](http://mathiasunberath.github.io/)

RESEARCH INTERESTS    My research consolidates efforts in computer vision, medical physics, and medicine to develop end-to-end systems that benefit interventions.  
My special interests are **multi-modal imaging systems**, **augmented reality**, and **machine learning** for percutaneous procedures.

PROFESSIONAL EMPLOYMENT    **Assistant Research Professor**    10/2018 – now  
[Johns Hopkins University](#), Department of Computer Science  
Affiliated with the [Laboratory for Computational Sensing + Robotics](#) and the [Malone Center for Engineering in Healthcare](#).  
**Postdoc**    06/2017 – 10/2018  
[Johns Hopkins University](#), Laboratory for Computational Sensing + Robotics  
With [Nassir Navab](#), [Mehran Armand](#), and [Russ Taylor](#).  
**Research Intern**    01/2017 – 04/2017  
[Johns Hopkins University](#), Computer Aided Medical Procedures  
With [Nassir Navab](#).  
**Research Intern**    03/2014 – 05/2014  
[Stanford University](#), Radiological Sciences Lab  
With [Rebecca Fahrig](#).  
**Research Assistant**    09/2012 – 01/2014  
[Siemens Healthcare GmbH](#), Angiography and Computed Tomography  
**Intern**    04/2010 – 0/82011  
[QRM GmbH](#), Quality Assurance in Radiology and Medicine

EDUCATION    **Ph. D. in Computer Science**, *Summa Cum Laude*    11/2014 – 05/2017  
[Friedrich-Alexander-Universität Erlangen-Nürnberg](#)  
Thesis: *Signal Processing for Interventional X-ray-based Coronary Angiography*  
With [Andreas Maier](#).  
**M. Sc. hons in Optical Technologies**, *Highest Distinction* 10/2012 – 10/2014  
[Friedrich-Alexander-Universität Erlangen-Nürnberg](#)  
Title: *3D+t Statistical Human Heart Phantom for X-Ray Projection Imaging*  
With [Andreas Maier](#) and [Rebecca Fahrig](#).  
**Visiting Scholar**    05/2014 – 10/2014  
[Stanford University](#), Radiological Sciences Lab  
With [Christian Riess](#) and [Rebecca Fahrig](#).

**B. Sc. in Physics** 10/2009 – 09/2012  
**Friedrich-Alexander-Universität Erlangen-Nürnberg**  
Title: *Electron Transport and Tunneling Effect in Multilayer Graphene Structures*  
With [Oleg Pankratov](#).

**Erasmus Scholar** 08/2011 – 12/2011  
**University of Eastern Finland**, Physics and Mathematics  
With [Pasi Vahimaa](#).

SELECTED AWARDS

**MICCAI Young Scientist Award** 2018  
For paper [C-28] at the MICCAI main conference.

**Best Paper Award** 2018  
For paper [C-32] at the MICCAI Workshop on CARE.

**Best Paper Award**, Second Place 2018  
For paper [C-31] at the MICCAI Workshop on CARE.

**MICCAI Commended Reviewer** 2018  
Awarded by the MICCAI Program Committee to outstanding reviewers.

**Staedtler Dissertation Award** 2018  
Awarded annually for the best Dissertations at FAU Erlangen-Nürnberg.

**Bildverarbeitung für die Medizin Award** 2018  
Awarded annually for the best German Dissertation in Medical Imaging.

**Best Student Paper Award**, Second Place 2017  
For paper [A-11] at the IEEE MIC.

**Finalist for Best Student Paper Award** 2016  
For paper [C-7] at the IEEE ISBI.

**Outstanding Thesis Award** 2015  
Awarded annually by the [SPIE Student Chapter, Erlangen](#).

**DAAD FITweltweit** fellowship 2014  
Awarded to outstanding CS majors conducting research abroad.

**Siemens Master's Program** fellow 2013, 2014  
Awarded annually to the 30 most promising engineering students in Germany.

**Erasmus** fellow 2011  
Awarded to excellent students participating in the Erasmus exchange.

FUNDING

**Granted Support:** \$ 252,000

- Johns Hopkins University DELTA Grant:** \$ 75,000 2018 – 2019  
"Personalized AR as an Interactive Teaching Tool for Facial Anatomy"  
With Nassir Navab, Elise Ng, and Nikki Tang (6 out of 64 funded).
- Johns Hopkins University DELTA Grant:** \$ 75,000 2018 – 2019  
"AR for Immersive 3D Education in Complex Pelvic Trauma Surgery"  
With Nassir Navab and Greg Osgood (6 out of 64 funded).

2. **EPRI: Electric Power Research Institute:** \$ 50,000 2017  
"Data Analysis Reporting Utilizing Augmented Reality"  
With B. Fuerst and N. Navab.

1. **German Research Foundation (DFG):** € 44,580 2014 – 2017  
Fellowship of the Erlangen Grad School in Advanced Optical Technologies

**Small Awards:** \$ 8,000

6. **NIH MICCAI Travel Grant:** \$ 500 2018

5. **NVIDIA GPU Grant Program:** Quadro P6000 2018  
"The Optimal Sweep: Learning Task-Based C-arm Trajectories from Data"

4. **IEEE Medical Imaging Conference Trainee Grant:** \$ 500 2017

3. **NVIDIA GPU Grant Program:** GeForce Titan Xp 2017  
"Deep Learning for K-wire Reconstruction"

2. **NIH IEEE ISBI Travel Grant:** \$ 700 2015

1. **Fully3D Travel Award Grant:** \$ 200 2015

SERVICES AND  
LEADERSHIP

**Organizer and Chair**

- Co-organizer, [CoronARe Challenge](#) 2017  
Held in conjunction with MICCAI.

**Services**

- Social Events and Sports Officer 2015 – 2018  
[MICCAI Society Student Board](#)
- Curriculum Committee Member (Studienkommission) 2013 – 2014  
Optical Technologies, Friedrich-Alexander-Universität Erlangen-Nürnberg
- Student Representative 2013 – 2014  
Optical Technologies, Friedrich-Alexander-Universität Erlangen-Nürnberg

**Funding Agency Reviewer**

- Deutsche Forschungsgemeinschaft (German Research Foundation, DFG)

**Book Reviewer**

- IOP Publishing, ebooks

**Journal Reviewer**

- Nature Scientific Reports
- Medical Image Analysis

- IEEE Transactions on Medical Imaging
- IEEE Transactions on Biomedical Engineering
- IEEE Robotics and Automation Letters
- IEEE Journal of Biomedical and Health Informatics
- PLoS ONE
- Physics in Medicine and Biology
- Computer Vision and Image Understanding
- Computers in Medicine and Biology

### Conference Reviewer

- Medical Image Computing and Computer Assisted Intervention 2018
- International Symposium on Mixed and Augmented Reality 2018
- IEEE International Symposium on Biomedical Imaging 2018

### TALKS AND PRESS

#### Invited Talks

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|---|---------|
| 8. Friedrich-Alexander-Universität, Erlangen, GER   | 10/2018 |
| “From Acquisition to Augmentation”  |         |
| 7. Imaging Elevated Symposium, Salt Lake City, UT   | 09/2018 |
| “Augmenting Reality: The Quest for Improved Intuition and Ergonomics in Percutaneous Surgery” |         |
| 6. Graduate School of Optical Technologies, Erlangen, DE                                      | 07/2018 |
| “Towards Task-aware Computer Assistance in the OR”  |         |
| 5. Children’s National Health System, Washington, DC  | 03/2018 |
| “Mixed Reality and Machine Learning for Image-guided Procedures”                              |         |
| 4. Bildverarbeitung für die Medizin, Erlangen, GER  | 03/2018 |
| “Prior-free Respiratory Motion Compensation in Rotational Angiography”                        |         |
| 3. Johns Hopkins Center for Imaging Science, Baltimore, MD                                    | 02/2018 |
| “Mixed Reality and Machine Learning for Image-guided Procedures”                              |         |
| 2. Food and Drug Administration, Silver Spring, MD  | 02/2018 |
| “Augmented Orthopedic Surgery”  |         |
| 1. Radiological Sciences Lab Meeting, Stanford, CA  | 10/2014 |
| “3D+t Statistical Shape Model of the Heart for X-ray Projection Imaging”                      |         |

#### Press

3. **Closing the Calibration Loop** 2018  
Best of MICCAI of Computer Vision News and MICCAI Daily Magazine
2. **Augmented reality amplifies X-ray images to help surgeons** 2018  
Health Data Management
1. **Augmented reality guides orthopedic surgery** 2018  
AuntMinnie.com

PUBLICATIONS I have (first/last/co)-authored 16-(5/2/9) journal articles, 33-(18/1/14) conference papers, and 14-(4/-/10) conference abstracts.

#### Peer-reviewed Journal Articles

- J-16. B. Stimpel, J. Wetzl, C. Forman, A. Maier, M. Schmidt, **M. Unberath**. “Automated Reformation of the Proximal Coronary Arteries in MR Angiography”, *Journal of Imaging*, to appear 2018. (Impact factor: NA)
- J-15. **M. Unberath\***, J. Fotouhi\*, J. Hajek\*, A. Maier, G. Osgood, R. Taylor, M. Armand, N. Navab. ”Augmented Reality-based Feedback for Technician-in-the-loop C-arm Repositioning”, *IET Healthcare Technology Letters*, to appear 2018. (Impact factor: 1.12)  
\* Joint first authors.
- J-14. T. Würfl, M. Hoffmann, V. Christlein, **M. Unberath**, A. Maier. “Deep Learning Cone-beam Computed Tomography: Learning Projection-Domain Weights from Image Domain in Limited Angle Problems”, *IEEE Transactions on Medical Imaging*, vol. 37, no. 6, 2018, pp. 1-12. (Impact factor: 6.13)
- J-13. Alexander Preuhs, Martin Berger, Sebastian Bauer, Thomas Redel, **M. Unberath**, S. Achenbach, A. Maier. “Viewpoint Planning for Quantitative Coronary Angiography”, *International Journal of Computer Assisted Radiology and Surgery*, vol. 7, 2018, pp. 1-9. (Impact factor: 1.96)
- J-12. **M. Unberath\***, O. Taubmann\*, A. Aichert, S. Achenbach, A. Maier. “Prior-free Respiratory Motion Estimation in Rotational Angiography”, *IEEE Transactions on Medical Imaging*, vol. PP, no. 99, 2018, pp. 1-11. (Impact factor: 6.13)  
\* Joint first authors.
- J-11. A. Klugmann\*, B. Bier\*, K. Müller, A. Maier, **M. Unberath**. “Deformable Respiratory Motion Correction for Hepatic Rotational Angiography”, *Computerized Medical Imaging and Graphics*, vol. 66, no. 6, 2018, pp. 82-89. (Impact factor: 2.44)  
\* Joint first authors.
- J-10. G. Deib, A. Johnson, **M. Unberath**, K. Yu, S. Andress, L. Qian, G. Osgood, N. Navab, F. Hui, P. Gailloud. “Image Guidance for Percutaneous Interventional Spine Procedures using an Optical See-through Head-mounted

Display: Proof of Concept and Rationale”, *Journal of NeuroInterventional Surgery*, neurintsurg-2017-013649. (Impact factor: 3.52)

- J-9. J. Fotouhi\*, B. Fuerst\*, **M. Unberath**, S. Reichenstein, S. C. Lee, A. Johnson, M. Armand, G. Osgood, N. Navab. “Automatic Intra-Operative Stitching of Non-Overlapping CBCT Acquisitions”, *Medical Physics*, vol. 45, no. 6, 2018, pp. 2463-2475. (Impact factor: 2.62)

\* Joint first authors.

**Editors’ Choice** of the June issue of *Medical Physics*.

- J-8. S. Andress\*, A. Johnson\*, **M. Unberath\***, A. Winkler\*, K. Yu, J. Fotouhi, S. Weidert, G. Osgood, N. Navab. “On-the-fly Augmented Reality for Orthopaedic Surgery Using a Multi-Modal Fiducial”, *SPIE Journal of Medical Imaging*, vol. 5, no. 2, 2018, pp. 021209. (Impact factor: 1.74)

\* Joint first authors listed alphabetically.

- J-7. B. Bier, N. Ravikumar, **M. Unberath**, M. Levenston, G. Gold, R. Fahrig, A. Maier. “Range Imaging for Motion Compensation in C-arm Cone-beam CT of Knees under Weight-bearing Conditions”, *Journal of Imaging*, vol. 4, no. 1, 2018, pp. 13. (Impact factor: NA)

- J-6. J. Fotouhi, C. P. Alexander, **M. Unberath**, G. Taylor, S. C. Lee, B. Fuerst, A. Johnson, G. Osgood, R. Taylor, H. Khanuja, M. Armand\*, N. Navab\*. “Plan in 2D, execute in 3D: An augmented reality solution for cup placement in total hip arthroplasty”, *SPIE Journal of Medical Imaging*, vol. 5, no. 2, 2018, pp. 021205. (Impact factor: 1.74)

\* Co-last authors.

- J-5. **M. Unberath**, O. Taubmann, M. Hell, S. Achenbach, A. Maier. “Symmetry, Outliers, and Geodesics in Coronary Artery Centerline Reconstruction from Rotational Angiography”, *Medical Physics*, vol. 44, no. 11, 2017, pp. 5672-5685. (Impact factor: 2.62)

- J-4. M. Berger, Y. Xia, W. Aichinger, K. Mentl, **M. Unberath**, A. Aichert, C. Riess, J. Hornegger, R. Fahrig, A. Maier. “Translational Motion Compensation for Cone-Beam CT Using Fourier Consistency Conditions”, *Physics in Medicine and Biology*, vol. 62, no. 17, 2017, pp.7181-7215. (Impact factor: 2.67)

Selected as **Featured Article** by *Physics in Medicine and Biology*.

- J-3. **M. Unberath**, A. Aichert, S. Achenbach, A. Maier. “Consistency-based Respiratory Motion Estimation in Rotational Angiography”, *Medical Physics*, vol. 44, no. 9, 2017, pp.113-124. (Impact factor: 2.62)

**Featured on the cover** of the September issue of *Medical Physics*.

- J-2. C. Riess, **M. Unberath**, F. Naderi, S. Pfaller, M. Stamminger, E. Angelopoulou. “Handling Multiple Materials for Exposure of Digital Forgeries using 2-D Lighting Environments”, *Multimedia Tools and Applications*, 2016, pp. 1-18. (Impact factor: 1.54)

- J-1. M. Berger, K. Müller, A. Aichert, **M. Unberath**, J. Thies, J-H. Choi, R. Fahrig, A. Maier. "Marker-free motion correction in weight-bearing cone-beam CT of the knee joint", *Medical Physics*, vol. 43, no. 3, 2016, pp. 1235-1248. (Impact factor: 2.62)

### Peer-reviewed Conference Papers

- C-33. M. Nejad, F. Alambeigi, A. Chamani, **M. Unberath**, H. Khanuja, M. Armand. "A Biomechanical Study on the Use of Curved Drilling Technique for Treatment of Osteonecrosis of Femoral Head", *MICCAI Workshop on Computational Biomechanics for Medicine*, to appear 2018.
- C-32. X. Liu, A. Sinha, **M. Unberath**, M. Ishii, G. Hager, A. Reiter, R. Taylor. "Self-supervised Learning for Dense Depth Estimation in Monocular Endoscopy", *MICCAI Workshop on Computer Assisted Robotic Endoscopy*, to appear 2018.  
Received the **Best Paper Award** at the *MICCAI Workshop on CARE*.
- C-31. C. Gao, X.Liu, M. Peven, **M. Unberath**, A. Reiter. "Learning to See Forces: Surgical Force Prediction with RGB-Point Cloud Temporal Convolutional Networks", *MICCAI Workshop on Computer Assisted Robotic Endoscopy*, to appear 2018.  
Received the **Best Paper Award**, Second Place at the *MICCAI Workshop on CARE*.
- C-30. B. Bier, K. Aschoff, C. Syben, **M. Unberath**, M. Levenston, G. Gold, R. Fahrig, A. Maier. "Detecting Anatomical Landmarks for Motion Estimation in Weight-bearing Imaging of Knees", *MICCAI Workshop on Machine Learning for Medical Image Reconstruction*, to appear 2018.
- C-29. **M. Unberath\***, J.-N. Zaech\*, S. C. Lee, B. Bier, J. Fotouhi, M. Armand, N. Navab. "DeepDRR: A Catalyst for Machine Learning in Fluoroscopy-guided Procedures", *Medical Image Computing and Computer Assisted Intervention*, 2018, pp.98-106.  
\* Joint first authors.
- C-28. B. Bier\*, **M. Unberath\***, J.-N. Zaech, J. Fotouhi, M. Armand, G. Osgood, N. Navab, A. Maier. "X-ray-transform Invariant Anatomical Landmark Detection for Pelvic Trauma Surgery", *Medical Image Computing and Computer Assisted Intervention*, 2018, pp.55-63.  
\* Joint first authors listed alphabetically.  
Received a **Travel Award** based on its review scores at *MICCAI*.  
Honored with a **MICCAI Young Scientist Award**.
- C-27. A. Preuhs, A. Maier, M. Manhart, J. Fotouhi, N. Navab, **M. Unberath**. "Double Your Views – Exploiting Symmetry in Transmission Imaging", *Medical Image Computing and Computer Assisted Intervention*, 2018, pp.356-364.
- C-26. J. Hajek\*, **M. Unberath\***, J. Fotouhi\*, B. Bier, S. C. Lee, G. Osgood, A. Maier, M. Armand, N. Navab. "Closing the Calibration Loop: An Inside-out

Tracking Paradigm for Augmented Reality in Orthopedic Surgery”, *Medical Image Computing and Computer Assisted Intervention*, 2018, pp.299-306.

\* Joint first authors.

Featured in **Best of MICCAI of Computer Vision News** and in *MICCAI Daily Magazine*.

C-25. J. Fotouhi\*, **M. Unberath\***, G. Taylor\*, A. G. Farashahi, B. Bier, R. Taylor, G. Osgood, M. Armand, N. Navab. ”Exploiting Partial Structural Symmetry for Patient-Specific Image Augmentation in Trauma Interventions”, *Medical Image Computing and Computer Assisted Intervention*, 2018, pp.107-115.

\* Joint first authors.

C-24. **M. Unberath\***, T. Geimer\*, J. Höhn, S. Achenbach, A. Maier. “Myocardial Twist from X-ray Angiography: Can we observe left ventricular twist in rotational coronary angiography?”, *Bildverarbeitung für die Medizin*, 2018, pp. 365-370.

\* Joint first authors.

C-23. K. Yu\*, R. Barmaki\*, **M. Unberath\***, A. Mears, J. Brey, T. H. Chung, N. Navab. “On the Accuracy of Low-cost Motion Capture Systems for Range of Motion Measurements”, *SPIE Medical Imaging*, vol. 105790, 2018, pp. 105790G.

\* Joint first authors.

C-22. E. Tucker, J. Fotouhi, S. C. Lee, **M. Unberath**, B. Fuerst, A. Johnson, M. Armand, G. Osgood, N. Navab. “Towards Clinical Translation of Augmented Orthopedic Surgery: From Pre-op CT to Intra-op X-ray via RGBD Sensing”, *SPIE Medical Imaging*, vol. 105790, 2018, pp. 105790J.

C-21. S. Andress\*, A. Johnson\*, **M. Unberath\***, A. Winkler\*, K. Yu, J. Fotouhi, S. Weidert, G. Osgood, N. Navab. “Technical Note: On-the-fly Augmented Reality for Orthopaedic Surgery Using a Multi-Modal Fiducial”, *SPIE Medical Imaging*, vol. 10576, 2018, pp. 10576H.

\* Joint first authors listed alphabetically.

C-20. J. Fotouhi, C. P. Alexander, **M. Unberath**, G. Taylor, S. C. Lee, B. Fuerst, A. Johnson, G. Osgood, R. Taylor, H. Khanuja, M. Armand, N. Navab. “An augmented reality system for total hip arthroplasty”, *SPIE Medical Imaging*, vol. 10576, 2018, pp. 10576J.

C-19. M. Amrehn, S. Gaube, **M. Unberath**, F. Schebesch, T. Horz, M. Strumia, S. Steidl, M. Kowarschik, A. Maier. “UI-Net: Interactive Artificial Neural Networks for Iterative Image Segmentation Based on a User Model”, Proceedings of the *Eurographics Workshop on Visual Computing for Biology and Medicine*, 2017.

C-18. B. Bier, **M. Unberath**, T. Geimer, J. Maier, G. Gold, M. Levenston, R. Fahrig, A. Maier. “Motion Compensation using Range Imaging in C-arm Cone-Beam CT”, *Medical Image Understanding and Analysis*, 2017.



- C-17. S. Çimen\*, **M. Unberath**\*, A. Frangi, A. Maier. “CoronARE: A Coronary Artery Reconstruction Challenge”, *MICCAI Workshop on Molecular Imaging, Reconstruction and Analysis of Moving Body Organs, and Stroke Imaging and Treatment*, 2017, pp.96-104.  
\* Joint first authors.
- C-16. **M. Unberath**, O. Taubmann, B. Bier, T. Geimer, M. Hell, S. Achenbach, A. Maier. “Respiratory Motion Compensation in Rotational Angiography: Graphical Model-based Optimization of Auto-focus Measures”, *IEEE International Symposium on Biomedical Imaging*, 2017.
- C-15. O. Taubmann\*, **M. Unberath**\*, G. Lauritsch, S. Achenbach, A. Maier. “Spatio-temporally regularized 4-D Cardiovascular C-arm CT Reconstruction Using a Proximal Algorithm”, *IEEE International Symposium on Biomedical Imaging*, 2017.  
\* Joint first authors.
- C-14. T. Geimer, **M. Unberath**, A. Birlutiu, O. Taubmann, J. Wölfelschneider, C. Bert, A. Maier. “A Kernel-based Framework for Intra-fractional Respiratory Motion Estimation in Radiation Therapy”, *IEEE International Symposium on Biomedical Imaging*, 2017.
- C-13. **M. Unberath**, A. Aichert, M. Berger, A. Maier. “Fourier Consistency-based Motion Estimation in Rotational Angiography”, *Bildverarbeitung für die Medizin*, 2017, pp.210-115.
- C-12. F. Schirrmacher\*, O. Taubmann\*, **M. Unberath**, A. Maier. “Towards Understanding Preservation of Periodic Object Motion in Computed Tomography”, *Bildverarbeitung für die Medizin*, 2017, pp.116-121.  
\* Joint first authors.
- C-11. T. Geimer, A. Birlutiu, **M. Unberath**, O. Taubmann, C. Bert, A. Maier. “A Kernel Ridge Regression Model for Respiratory Motion Estimation in Radiotherapy”, *Bildverarbeitung für die Medizin*, 2017, pp.155-160.
- C-10. B. Bier, A. Aichert, L. Felsner, **M. Unberath**, R. Fahrig, A. Maier. “Epipolar Consistency Conditions for Motion Correction in Weight-Bearing Imaging”, *Bildverarbeitung für die Medizin*, 2017, pp.209-214.
- C-9. **M. Unberath**\*, A. Aichert\*, S. Achenbach, A. Maier. “Improving Segmentation Quality in Rotational Angiography Using Epipolar Consistency”, *Joint MICCAI Workshop on Computing and Visualisation for Intravascular Imaging and Computer-Assisted Stenting*, 2016.  
\* Joint first authors.
- C-8. **M. Unberath**, A. Aichert, S. Achenbach, A. Maier. “Virtual Single-frame Subtraction Imaging”, *Proceedings of the 4th International Conference on Image Formation in X-Ray Computed Tomography*, 2016, pp.89-92.
- C-7. **M. Unberath**, S. Achenbach, R. Fahrig, A. Maier. “Exhaustive Graph Cut-based Vasculature Reconstruction”, *IEEE International Symposium on Biomedical Imaging*, 2016, pp.1243-1246.

- C-6. F. Schebesch\*, **M. Unberath\***, I. Andersen, A. Maier. “Breast Density Assessment Using Wavelet Features on Mammograms”, *Bildverarbeitung für die Medizin*, 2016, pp.38-43.  
\* Joint first authors.
- C-5. J. Bopp, **M. Unberath**, S. Steidl, R. Fahrig, I. Oliveira, A. Kleyer, A. Maier. “Automatic Finger Joint Detection for Volumetric Hand Imaging”, *Bildverarbeitung für die Medizin*, 2016, pp.38-43.
- C-4. **M. Unberath**, K. Mentl, O. Taubmann, S. Achenbach, R. Fahrig, J. Hornegger, A. Maier. “Torsional Heart Motion in Cone-beam Computed Tomography Reconstruction”, *Fully Three-Dimensional Image Reconstruction in Radiology and Nuclear Medicine*, 2015, pp.651-654.
- C-3. Y. Lu, J. Geret, **M. Unberath**, M. Manhart, Q. Ren, R. Fahrig, J. Hornegger, A. Maier. “Projection-based Material Decomposition by Machine Learning using Image-based Features for Computed Tomography”, *Fully Three-Dimensional Image Reconstruction in Radiology and Nuclear Medicine*, 2015, pp.448-451.
- C-2. **M. Unberath**, A. Maier, D. Fleischmann, J. Hornegger, R. Fahrig. “Open-source 4D Statistical Shape Model of the Heart for X-ray Projection Imaging”, *IEEE International Symposium on Biomedical Imaging*, 2015, pp.739-742.
- C-1. **M. Unberath**, J-H. Choi, M. Berger, A. Maier, R. Fahrig. “Image-based Compensation for Involuntary Motion in Weight-bearing C-arm Cone-beam CT Scanning of the Knees”, *SPIE Medical Imaging*, 2015, pp.94130D-7.

#### Peer-reviewed Conference Abstracts

- A-14. F. Creighton, **M. Unberath**, Z. Zhao, N. Navab, M. Armand, J. Carey. “Early Feasibility Studies of Augmented Reality Image Navigation for Skull Base Surgery”, *AAO-HNSF 2018 Annual Meeting & OTO Experience*, 2018.
- A-13. **M. Unberath**, J. Fotouhi, E. Tucker, A. Johnson, G. Osgood, N. Navab. “Percutaneous Pelvis Fixation Using the Camera-augmented C-arm”, *Bildverarbeitung für die Medizin*, 2018.
- A-12. G. Deib, A. Johnson, **M. Unberath**, K. Yu, S. Andress, L. Qian, G. Osgood, N. Navab, F. Hui, P. Gailloud. “Technical Note: Image Guidance for Percutaneous Vertebroplasty using an Optical see-through head-mounted display.”, *World Federation of Interventional and Therapeutic Neuroradiology*, 2017.
- A-11. **M. Unberath**, J. Hajek, T. Geimer, F. Schebesch, M. Amrehn, A. Maier. “Deep Learning-based Inpainting for Virtual DSA”, *Proceedings of the IEEE Nuclear Science Symposium and Medical Imaging Conference*, 2017.  
Awarded with the **Best Student Paper Award**, Second Place.

- A-10. B. Bier, **M. Unberath**, T. Geimer, N. Ravikumar, G. Gold, R. Fahrig, A. Maier. “Fusing Motion Estimates for CBCT Reconstruction”, *Proceedings of the IEEE Nuclear Science Symposium and Medical Imaging Conference*, 2017.
- A-9. B. Bier, **M. Unberath**, N. Ravikumar, J. Maier, A. Gooya, Z. A. Taylor, A. Frangi, G. Gold, R. Fahrig, A. Maier. “Surface Registration to Estimate Motion in CBCT”, *Proceedings of the IEEE Nuclear Science Symposium and Medical Imaging Conference*, 2017.
- A-8. T. Geimer, J. Höhn, **M. Unberath**, A. Maier. “Parametric LV Model Fitting to Coronary Arteries”, *Proceedings of the IEEE Nuclear Science Symposium and Medical Imaging Conference*, 2017.
- A-7. L. Felsner, A. Aichert, **M. Unberath**, A. Maier. “Motion Estimation in Rotational Angiography with Alpha-Expansion Moves”, *Proceedings of the IEEE Nuclear Science Symposium and Medical Imaging Conference*, 2017.
- A-6. O. Rybakov, B. Bier, J. Maier, **M. Unberath**, A. Maier. “Simultaneous Generation of X-ray and Range Images using XCAT under Motion”, *Proceedings of the IEEE Nuclear Science Symposium and Medical Imaging Conference*, 2017.
- A-5. B. Stimpel, **M. Unberath**, J. Wetzl, M. Schmidt, A. Maier, C. Forman. “Automatic Coronary Artery Ostia Detection in Magnetic Resonance Angiography”, *International Society for Magnetic Resonance in Medicine (ISMRM), Annual Meeting & Exhibition*, 2017.
- A-4. B. Bier, M. Berger, J. Maier, **M. Unberath**, S. Hsieh, S. Bonaretti, R. Fahrig, M. E. Levenston, G. E. Gold, A. Maier. “Object Removal in Gradient Domain of Cone-Beam CT Projections”, *Proceedings of the IEEE Nuclear Science Symposium and Medical Imaging Conference*, 2016.
- A-3. **M. Unberath**, E. Goppert, O. Taubmann, A. Maier. “Mitigating Medialness Responses from Non-tubular Structures Using Entropy”, *Computer Assisted Radiology and Surgery (CARS) 2016: Proceedings of the 30th Congress and Exhibition*, 2016, pp.211-212.
- A-2. T. Geimer, **M. Unberath**, O. Taubmann, C. Bert, A. Maier. “Combination of Markerless Surrogates for Motion Estimation in Radiation Therapy”, *Computer Assisted Radiology and Surgery (CARS) 2016: Proceedings of the 30th Congress and Exhibition*, 2016, pp.59-60.
- A-1. **M. Unberath**, A. Maier, D. Fleischmann, J. Hornegger, R. Fahrig. “Comparative Evaluation of Two Registration-based Segmentation Algorithms: Application to Whole Heart Segmentation in CT”, *11th German Russian Conference on Biomedical Engineering*, 2015, pp.5-8.

**Preprints:** Submitted for peer review

- P-2. L. Qian, **M. Unberath**, K. Yu, B. Fuerst, A. Johnson, N. Navab, G. Osgood. "Technical Note: Towards Virtual Monitors for Image Guided Interventions - Real-time Streaming to Optical See-Through Head-Mounted Displays", *arXiv preprint*, 2017, arXiv:1710.00808.
- P-1. T. Geimer, **M. Unberath**, O. Taubmann, A. Birlutiu, M. Ziegler, J. Wölfelschneider, C. Bert, A. Maier. "Kernel-based Respiratory Motion Field Estimation in Image-guided Radiation Therapy", *Physics in Medicine and Biology*.

#### TEACHING

**Augmented Reality EN.601.454/654**, Guest Lecturer  
Johns Hopkins University  
Spring 2018

**Computer Integrated Surgery II EN.601.456/656**, Project Mentor  
Johns Hopkins University  
Spring 2017, Spring 2018

**Flat Panel CT Reconstruction**, Guest Lecturer and Teaching Assistant  
Friedrich-Alexander-Universität Erlangen-Nürnberg  
Winter 2014/15, Spring 2015, Winter 2015/16, Spring 2016, Winter 2016/17

#### MENTORING

##### **M. Sc. Theses**

12. Jan-Nico Zäch, Johns Hopkins University 2017  
"Machine Learning for Image-guided Orthopedic Surgery"  
Jan-Nico was awarded a **DAAD FITWeltweit fellowship** for this project.
11. Jonas Hajek, Johns Hopkins University 2017  
"An Inside-out Tracking Paradigm for Augmented Reality in Surgery"  
Jonas was awarded a **DAAD Promos fellowship** for this project.
10. Emerson Tucker, Johns Hopkins University 2017  
"Towards Clinical Translation of Augmented Orthopedic Surgery"
9. Kevin Yu, Johns Hopkins University 2017  
"Augmenting Users With Anatomy"
8. Lina Felsner, FAU Erlangen-Nürnberg 2017  
"Motion Correction in Rotational Angiography using Epipolar Consistency"
7. Johannes Höhn, FAU Erlangen-Nürnberg 2016  
"A Parametric Myocardial Model from Coronary Artery Centerlines"
6. Alexandra Höfer, FAU Erlangen-Nürnberg 2016  
"Automatic Respiratory Motion Correction for Liver Perfusion Imaging"  
With K. Müller, Stanford University.
5. Moritz Petry, FAU Erlangen-Nürnberg 2016  
"Breast Density Segmentation for Lesion Detection in Mammography"

4. Xinyun Li, FAU Erlangen-Nürnberg 2016  
“Vessel tree reformation for coronary arteries from CTA”
3. Bernhard Stimpel, FAU Erlangen-Nürnberg 2016  
“Automatic Coronary Ostia Detection in MR Angiography”  
With C. Forman, Siemens Healthcare GmbH.
2. Johannes Bopp, FAU Erlangen-Nürnberg 2015  
“Classification of Erosions in MRI for Rheumatoid Arthritis”
1. Tobias Geimer, FAU Erlangen-Nürnberg 2015  
“Multiple Surrogates for Dense 3D Respiratory Motion Field Estimation”

### B.Sc. Theses

5. Jonas Hajek, FAU Erlangen-Nürnberg 2016  
“Deep Learning-based inpainting for Virtual DSA”
4. Felix Denzinger, FAU Erlangen-Nürnberg 2016  
“Vasculature Reconstruction Using Epipolar Geometry”
3. Ingwer Andersen, FAU Erlangen-Nürnberg 2015  
“Automatic Malignancy Assessment in Mammography”
2. Eric Goppert, FAU Erlangen-Nürnberg 2015  
“4D Statistical Shape Model of the Coronary Arteries”
1. Rimón Saffoury, FAU Erlangen-Nürnberg 2014  
“Ein Formmodell für automatische Nierensegmentierung aus CT-Datensätzen”

### Other Projects

9. Jared Pangallozzi, Johns Hopkins University 2018  
“A *Magic Mirror* for Learning Facial Anatomy”
8. Wenhao Gu, Johns Hopkins University 2018  
“Collaborative Augmented Reality for Pelvic Fracture Reduction”
7. Tianyu Song, Johns Hopkins University 2018  
“An Augmented Reality Environment for Craniotomy Planning”
6. Michael Mudgett and Mariya Kazachkova, Johns Hopkins University 2018  
“Tool Tracking in Hyper Low Dose Fluoroscopy in Orthopedic Surgery”
5. Billy Carrington and Wenhao Gu, Johns Hopkins University 2018  
“Tool Tacking for Periacetabular Osteotomy using CamC”
4. Jie Ying Wu and Athira Jacob, Johns Hopkins University 2017  
“Deep Learning-based K-wire Tracking”  
Awarded with a **Project Award** by *The Engineering Research Center*.
3. Björn Osterwald, FAU Erlangen-Nürnberg 2016  
“Motion Detection in CBCT using Fourier Analysis of Forward Projections”

2. Franziska Schirmacher, FAU Erlangen-Nürnberg 2016  
“Motion Patterns in Reconstruction-Then-Backprojection Settings”
1. Nima Meyer, FAU Erlangen-Nürnberg 2015  
“Non-rigid Registration using Skull-Stripping in Non-contrasted head CT”