

Ole Marius Hoel Rindal



Birth date: April 5th, 1990

Phone: +47 456 12 838

E-mail: olemarius@olemarius.net

Address: Brattelia 3, 0875 Oslo, Norway

Google Scholar: citations: 1005, h-index: 15

Education

2014-2019 PhD student in medical ultrasound imaging at the Signal Processing and Image Analysis research group, University of Oslo.

Visiting scholar at the Pulse Lab at Johns Hopkins University for 4 months in 2016/17.

Thesis: *Software Beamforming in Medical Ultrasound Imaging - a blessing and a curse.*

Available at <https://www.duo.uio.no/handle/10852/73764>.

2009-2014: Robotics and intelligent systems, 5 year master's program, University of Oslo.

Master thesis: *Static Elastography With Ultrasound Using Adaptive Beamformers.*

Available at www.duo.uio.no/handle/10852/42130.

2006-2009: Hamar Katedralskole, upper secondary education

Exchange year (2007-2008) at Newcastle High School, senior year, Oklahoma, USA.

Work experience

January 2022 - present: Co-founder and Technology Manager in Sonair AS.

Startup company creating a 3D ultrasound sensor for object detection for autonomous robots using MEMS ultrasound sensors spinning off from SINTEF. More information at www.sonair.com.

August 2021 - present 20% position as Senior Lecturer at the Signal Processing and Image Analysis research group at the Department of Informatics, University of Oslo.

January 2020 - Oktober 2023: PostDoctor (75% position) at CIUS (Center for Innovative Ultrasound Solutions), University of Oslo.

March 2019 - December 2022: Researcher (25% position) at SINTEF Digital, Smart Sensor Systems.

January 2015 - March 2019: Researcher (20% position) at Center for Elite Sports Research, Norwegian University of Science and Technology. Developed machine learning algorithms for a sensor system to analyze cross country skiing techniques.

January 2014 - January 2016: CEO and founder of Skiflex AS.

Developing a sensor solution to measure cross country skis. *The company has been terminated, but the project was continued in a master thesis at UiO.*

June 2014 - September 2014 Research assistant at the University of Oslo.

Funded by the Norwegian Research School in Medical Imaging (MedIm).

September 2012 - December 2013: Technical consultant for the startup company Smartski AS.

Developed a machine learning algorithm to classify cross country skiing techniques.

November 2011 - May 2013: Taught programming courses for children at Forskerfabrikken.

Summer 2013: *Summer Intern* with the audio group at Cisco Systems.

Summer 2012: *Summer Intern* with the audio group at Cisco Systems.

Summer 2011: Teacher at "Sommerskolen i Oslo", robotics courses for kids.

Summer 2010: Assistant teacher at "Sommerskolen i Oslo", robotics courses for kids.

Technical qualifications

Programming languages: Python, MATLAB, Java and C

Very good knowledge of the Git version control system, including branching models such as GitFlow.

Organisational Experience

2024-present: Chairman of the board at Blindern Barnestuer Barnehage.

2021-present: Board member (Rådsmedlem) at Blindern Studenterhjem, appointed by the University of Oslo.

2023-2024: Deputy chairman in the board at Blindern Barnestuer Barnehage.

2018-2019: Alternate member of the board in Blindern Barnestuer Barnehage.

2015-2018: Organizing the weekly DSP(digital signal processing and image analysis)-seminar at UiO.

2011/12/14: Referee in First Leago League, LEGO-robot competition for kids.

2011-2012: Internal auditor Blindern Studenterhjem (Student home).

Jan-Jun, 2011: Student member in Stiftelsen Blindern Studenterhjem (establishment).

2010-2011: Member of the kollegial (Kollegiet) Blindern Studenterhjem.

2008-2009: School representative for Hamar Katedralskole in Elevorganisasjonen (School Student Union of Norway).

2008-2009: Leader of the student council Hamar Katedralskole (1350 students).

2008-2009: Board member of the youth council (Ungdomsrådet) in Hamar Kommune (municipality).

Awards

CIUS (Center for Innovative Ultrasound Solutions) innovation award 2021 for the DOFI (Declaration Of Innovation) describing *Global Image Coherence a quantitative metric for ultrasound image quality*.

Teaching

2021-present: IN3015/4015 Ultrasound Imaging

Developed this bachelor/master course around the UltraSound ToolBox and wrote a compendium (Software Beamforming in Medical Ultrasound Imaging) based on my PhD thesis. Currently administrating and teaching a major part.

2014-2015: INF4300 Digital Image Analysis

Group teacher organizing lab work and mandatory assignments in this course contacting digital image analysis techniques including early machine learning methods.

2014-2015: INF2310 Digital Image Processing

Lecture 50% of this course as part of teaching duties of my PhD.

Invited presentations

Rindal, O. M. H., The Myriad of metrics in medical ultrasound imaging; Which should we use? , Acoustical Society of America, 183rd Meeting, Nashville, US, 2022.

Rindal O. M. H., "Software Beamforming in Medical Ultrasound Imaging â A Blessing and a Curse", AIUM (American Institute of Ultrasound in Medicine (AIUM)) during the "Basic Science and Instrumentation - Lecture Series" in the session "Not your parent delay-and-sum beamformer anymore". 2020

Research Projects

The UltraSound ToolBox (www.USTB.no)

Administrating and actively developing an open source MATLAB toolbox for processing ultrasonic signals. The aim is to facilitate the comparison of imaging techniques and the dissemination of research results.

SoundVision (www.sonair.com)

An IPN Project (Innovation Projects for the Industrial Sector) supported by the Norwegian Research Council and Sonair AS. We are developing an ultrasonic 3D distance sensor for autonomous robots. I am a co-founder of Sonair AS.

SkiAlive

An IPN Project (Innovation Projects for the Industrial Sector) supported by the Norwegian Research Council and Madshus continuing the work on analysing ski technique using micro sensors but also brought the analysis to analyze individual skis. I worked on this project as an employee at SINTEF.

Hypersension

An IPN Project (Innovation Projects for the Industrial Sector) supported by the Norwegian Research Council and DATEK AS to develop a sensor to do cuffless blood pressure measurements. I worked on this project as an employee at SINTEF.

AutoActive /www.sintef.no/projectweb/autoactive/

An IKT+ project from the Norwegian Research Council. A project to research tools and methods for autonomous analysis of human activities from wearable device sensor data. I worked on this project as an employee at SINTEF. This continued the work on analysing cross country skiing with sensors but also moved this technology to analyse walking patterns from MS patients with the MS center in Hakkadal.

Fabuli

A Forny Start grant supported by the Norwegian Research Council to commercialize an algorithm developed during my PhD for faster and better ultrasound imaging. Resulted in a patent application.

emPower

An IPN Project (Innovation Projects for the Industrial Sector) supported by the Norwegian Research Council and Madshus. I was employed with a 20% position from NTNU. We developed an sensor system and algorithms to analyze cross contry skiing technique.

Popular science publications

Forskere kan takke gamere for bedre ultralydbilder av hjertet Gemini 2023

www.gemini.no/2023/03/forskere-kan-takke-gamere-for-bedre-ultralydbilder-av-hjertet/

Skiteknikk under lupen med sensordata og maskinl ring, Titan 2023

www.titan.uio.no/innovasjon/2023/skiteknikk-under-med-lupen-med-sensordata-og-maski.html

Avanserte metoder gir kun selfiefilter-effekt p  ultralydbildene , Titan, Teknisk Ukeblad 2023

www.tu.no/artikler/flere-vil-lage-bedre-ultralydbilder-ofte-gir-det-kun-selfiefilter-effekt-525357

Open source processing of ultrasound images with the USTB CIUS blogg 2021

<https://www.ntnu.no/blogger/cius/2021/open-source-processing-of-ultrasound-images-with-the-ustb>

Ultralyd-forbedringer gir ogs  utfordringer, Titan 2020

www.titan.uio.no/livsvitenskap-teknologi/2020/ultralyd-forbedringer-gir-ogsa-utfordringer

Datafangst i sporet skal gi gullski fra Madshus, Teknisk Ukeblad 2020

www.tu.no/artikler/datafangst-i-spoet-skall-gullski-fra-madshus/485195

Kvinner og menn velger ulik teknikk i skispoet, Gemini 2019

<https://gemini.no/2019/02/kvinner-og-menn-velger-ulik-teknikk-i-skispoet/>

Ski-eliten kvesser teknikken med sensorer p  kroppen, Gemini 2018

www.gemini.no/2018/02/ski-eliten-kvesser-teknikken-sensorer-pa-kroppen/

List of Publications

Organized by research topic in reverse chronological order, selected publications in **bold**. Included are publications ranked as "Level 1" by the Norwegian Register for Scientific Journals, Series and Publishers. For a more complete list of all publication see Google Scholar (<https://scholar.google.com/citations?user=YUXh2GgAAAAJ>) or Cristin (<https://app.cristin.no/persons/show.jsf?id=618806>).

On beamforming in medical ultrasound imaging

1. A. E. Vrålstad, M. D. Kvalevåg, O. M. H. Rindal, and S.-E. Måsøy, "Universal REFoCUS Beamforming With Spatial Weighting," *IEEE Open Journal of Ultrasonics Ferroelectrics and Frequency Control*, vol. 1, no. April, pp. 15–26, 2024
2. **O. M. H. Rindal, T. G. Bjastad, T. Espeland, E. A. R. Berg, and S. E. Masoy, "A Very Large Cardiac Channel Data Database (VLCD) used to Evaluate Global Image Coherence (GIC) as an In-Vivo Image Quality Metric," *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, vol. 70, no. 10, pp. 1295–1307, 2023**
3. S.-E. Måsøy, B. Dénarié, A. Sørnes, E. Holte, B. Grenne, T. Espeland, E. A. R. Berg, O. M. H. Rindal, W. Rigby, and T. Bjåstad, "Aberration correction in 2D echocardiography," *Quantitative Imaging in Medicine and Surgery*, vol. 13, no. 7, pp. 4603–4617, 2023
4. M. D. Kvalevåg, A. E. Vrålstad, O. M. H. Rindal, T. G. Bjåstad, B. Denarie, K. Kristoffersen, S. E. Måsøy, and L. Løvstakken, "vbeam: a Fast and Differentiable Beamformer for Optimizing Ultrasound Imaging," *IEEE International Ultrasonics Symposium, IUS*, pp. 1–4, 2023
5. O. M. H. Rindal, A. Vralstad, T. G. Bjastad, A. Austeng, and S. E. Masoy, "Coherence from REFoCUS compared to Retrospective Transmit Beamforming," *IEEE International Ultrasonics Symposium, IUS*, vol. 2022-October, 2022
6. H. K. Arnestad, A. Austeng, S. P. Nasholm, and O. M. H. Rindal, "The Effect of Retrospective Transmit Focusing on Minimum Variance Beamforming," *IEEE International Ultrasonics Symposium, IUS*, vol. 2022-October, 2022
7. O. M. H. Rindal, A. Rodriguez-Molares, and A. Austeng, "Resolution Measured as Separability Compared to Full Width Half Maximum for Adaptive Beamformers," *IEEE International Ultrasonics Symposium, IUS*, no. 1, pp. 16–19, 2020
8. **A. Rodriguez-Molares, O. M. H. Rindal, J. D'Hooze, S. E. Masoy, A. Austeng, M. A. Lediju Bell, and H. Torp, "The Generalized Contrast-to-Noise Ratio: A Formal Definition for Lesion Detectability," *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, vol. 67, no. 4, pp. 745–759, 2020**
9. **O. M. H. Rindal, A. Austeng, A. Fatemi, and A. Rodriguez-Molares, "The Effect of Dynamic Range Alterations in the Estimation of Contrast," *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, vol. 66, no. 7, pp. 1198–1208, 2019**
10. C. L. Palmer and O. M. H. Rindal, "Wireless, Real-Time Plane-Wave Coherent Compounding on an iPhone: A Feasibility Study," *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, vol. 66, no. 7, pp. 1222–1231, 2019
11. **A. Wiacek, O. M. H. Rindal, E. Falomo, K. Myers, K. Fabrega-Foster, S. Harvey, and M. A. L. Bell, "Robust Short-Lag Spatial Coherence Imaging of Breast Ultrasound Data: Initial Clinical Results," *IEEE Trans on Ultrasonics, Ferroelectrics, and Frequency Control*, vol. In print, 2018**
IEEE TUFFC editors selection in December 2019.
12. O. M. H. Rindal, A. Rodriguez-Molares, and A. Austeng, "A simple , artifact-free , virtual source model," *IEEE International Ultrasonics Symposium, IUS*, pp. 1–4, 2018
13. A. Wiacek, E. Falomo, K. Myers, O. M. H. Rindal, K. Fabrega-foster, S. Harvey, and M. A. L. Bell, "Clinical Feasibility of Coherence-Based Beamforming to Distinguish Solid from Fluid Hypoechoic Breast Masses," *IEEE International Ultrasonics Symposium, IUS*, pp. 1–4, 2018
14. A. Rodriguez-Molares, O. M. H. Rindal, D. Jan, S.-E. Måsøy, A. Austeng, and H. Torp, "The Generalized Contrast-to-Noise Ratio," *IEEE International Ultrasonics Symposium, IUS*, no. 6, pp. 1–4, 2018
15. O. Bernard, H. H. G. Hansen, P. Kruizinga, E. Mc, S. Ricci, O. M. H. Rindal, A. Rodriguez-molares, M. B. Stuart, and P. F. V. Dos Santos, "The Ultrasound File Format (UFF) - First draft," *IEEE International Ultrasonics Symposium, IUS*, 2018

16. F. Prieur, O. M. H. Rindal, and A. Austeng, "Signal coherence and image amplitude with the filtered delay multiply and sum beamformer," in *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, vol. 65, no. 7, 2018, pp. 1133–1140
IEEE TUFFC editors selection in February 2019.
17. O. M. H. Rindal, S. Aakhus, S. Holm, and A. Austeng, "Hypothesis of Improved Visualization of Microstructures in the Interventricular Septum with Ultrasound and Adaptive Beamforming," *Ultrasound in Medicine and Biology*, vol. 43, no. 10, pp. 2494–2499, 2017
18. O. M. H. Rindal, A. Rodriguez-Molares, and A. Austeng, "The Dark Region Artifact in Adaptive Ultrasound Beamforming," *IEEE International Ultrasonics Symposium, IUS*, pp. 1–4, 2017
19. S. M. Hverven, O. M. H. Rindal, A. Rodriguez-Molares, and A. Austeng, "The Influence of Speckle Statistics on Contrast Metrics in Ultrasound Imaging," *IEEE International Ultrasonics Symposium, IUS*, pp. 1–4, 2017
20. F. Prieur, O. M. H. Rindal, S. Holm, and A. Austeng, "Influence of the Delay-Multiply-And-Sum beamformer on the ultrasound image amplitude," *IEEE International Ultrasonics Symposium 2017, IUS*, pp. 1–4, 2017
21. **A. Rodriguez-Molares, O. M. H. Rindal, O. Bernard, A. Nair, M. A. L. Bell, H. Liebgott, A. Austeng, and L. Løvstakken, "The UltraSound ToolBox," *IEEE International Ultrasonics Symposium, IUS*, pp. 1–4, 2017**
22. S. Hverven, O. M. H. Rindal, A. Hunter, and A. Austeng, "Point scatterer enhancement in ultrasound by wavelet coefficient shrinkage," in *IEEE International Ultrasonics Symposium, IUS*, 2017, pp. 1–4
23. O. M. H. Rindal and A. Austeng, "Double Adaptive Plane-Wave Imaging," *IEEE International Ultrasonics Symposium, IUS*, pp. 8–11, 2016
24. O. M. H. Rindal, A. Austeng, H. Torp, S. Holm, and A. Rodriguez-Molares, "The dynamic range of adaptive beamformers," *IEEE International Ultrasonics Symposium, IUS*, no. 1, pp. 1–4, 2016
25. C. L. Palmer, O. M. H. Rindal, S. Holm, and A. Austeng, "Realtime plane-wave software beamforming with an iPhone," *IEEE International Ultrasonics Symposium, IUS*, pp. 1–4, 2016
26. O. M. H. Rindal, J. P. Åsen, S. Holm, and A. Austeng, "Understanding Contrast Improvements from Capon Beamforming," in *IEEE International Ultrasonics Symposium, IUS*, no. 1, 2014, pp. 1694–1697

On wearable sensor systems and machine learning in cross country skiing

1. J. Tjønnås, T. M. Seeberg, O. M. H. Rindal, P. Haugnes, and Ø. Sandbakk, "Assessment of basic motions and technique identification in classical cross-country skiing," *Frontiers in Psychology*, vol. 10, 2019
2. G. S. Solli, J. Kocbach, T. M. Seeberg, J. Tjønnås, O. M. H. Rindal, P. Haugnes, P. Ø. Torvik, and Ø. Sandbakk, "Sex-Based Differences in Speed, Sub-Technique Selection, and Kinematic Patterns during Low- and High-Intensity Training for Classical Cross-Country Skiing," *PLOSone*, vol. Accepted., 2018
3. **O. M. H. Rindal, T. M. Seeberg, J. Tjønnås, P. Haugnes, and Ø. Sandbakk, "Automatic classification of sub-techniques in classical cross-country skiing using a machine learning algorithm on micro-sensor data," *MDPI Sensors*, vol. 18, no. 1, 2018**
4. T. M. Seeberg, J. Tjønnås, O. M. H. Rindal, P. Haugnes, S. Dalgard, and Ø. Sandbakk, "A multi-sensor system for automatic analysis of classical cross-country skiing techniques," *Sports Engineering*, vol. 20, no. 4, pp. 313–327, 2017

On blood pressure measurements using sensors and machine learning

1. S. Heimark, I. Eitzen, I. Vianello, K. G. Bøtker-Rasmussen, A. Mamen, O. M. Hoel Rindal, B. Waldum-Grevbo, Ø. Sandbakk, and T. M. Seeberg, "Blood Pressure Response and Pulse Arrival Time During Exercise Testing in Well-Trained Individuals," *Frontiers in physiology*, vol. 13, no. 2, pp. 139–146, 2022
2. **S. Heimark, O. M. H. Rindal, T. M. Seeberg, A. Stepanov, E. S. Boysen, K. G. Bøtker-Rasmussen, N. K. Mobæk, C. L. Søråas, A. E. Stenehjelm, F. E. M. Fadl Elmula, and B. Waldum-Grevbo, "Blood pressure altering method affects correlation with pulse arrival time," *Blood Pressure Monitoring*, vol. 27, no. 2, pp. 139–146, 2022**

Patents

1. O. M. H. Rindal, A. Austeng, and A. Rodriguez-Molares, “Method and apparatus for adaptive beam-forming,” *United States Patent Application Publication*, 2019

Last update: January 6, 2025