

PROCEEDINGS OF SPIE

# ***Anomaly Detection and Imaging with X-Rays (ADIX) V***

**Amit Ashok**  
**Joel A. Greenberg**  
**Michael E. Gehm**  
*Editors*

**27 April – 8 May 2020**  
**Online Only, United States**

*Sponsored and Published by*  
SPIE

**Volume 11404**

Proceedings of SPIE 0277-786X, V. 11404

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

The papers in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. Additional papers and presentation recordings may be available online in the SPIE Digital Library at [SPIDigitalLibrary.org](http://SPIDigitalLibrary.org).

The papers reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from these proceedings:

Author(s), "Title of Paper," in *Anomaly Detection and Imaging with X-Rays (ADIX) V*, edited by Amit Ashok, Joel A. Greenberg, Michael E. Gehm, Proceedings of SPIE Vol. 11404 (SPIE, Bellingham, WA, 2020) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510635852

ISBN: 9781510635869 (electronic)

Published by

**SPIE**

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time) Fax +1 360 647 1445

[SPIE.org](http://SPIE.org)

Copyright © 2020, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$21.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at [copyright.com](http://copyright.com). Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/20/\$21.00.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

Publication of record for individual papers is online in the SPIE Digital Library.

**SPIE. DIGITAL LIBRARY**

[SPIDigitalLibrary.org](http://SPIDigitalLibrary.org)

---

**Paper Numbering:** *Proceedings of SPIE* follow an e-First publication model. A unique citation identifier (CID) number is assigned to each article at the time of publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc. The CID Number appears on each page of the manuscript.

# Contents

---

## SYSTEM SIMULATION AND MACHINE LEARNING

---

- 11404 02 **Modeling realistic virtual objects within a high-throughput x-ray simulation framework (Invited Paper)** [11404-3]
- 11404 04 **Background adaptive faster R-CNN for semi-supervised convolutional object detection of threats in x-ray images** [11404-5]

---

## PHASE AND SCATTER SYSTEMS

---

- 11404 08 **Design and development of a rotating-anode x-ray tube coherent scatter projection imaging system** [11404-9]

---

## ALGORITHMS

---

- 11404 09 **Cargo segmentation in stream of commerce (SoC) x-ray images with deep learning algorithms (Invited Paper)** [11404-11]
- 11404 0B **Adaptive target recognition: a case study involving airport baggage screening** [11404-13]

---

## NOVEL SYSTEMS, MODELS, ANALYSIS

---

- 11404 0E **Coded aperture optimization in x-ray tomosynthesis via sparse principal component analysis** [11404-16]
- 11404 0F **3D trajectory reconstruction of fast moving objects under harsh conditions using flash radiography** [11404-17]
- 11404 0G **X-ray measurement model and information-theoretic metric incorporating material variability with spatial and energy correlations** [11404-18]

---

## DIFFRACTION SYSTEMS

---

- 11404 0H **Task-specific information in x-ray diffraction and transmission modalities: a comparative analysis** [11404-20]