

# Nathaniel D. Bird, Ph.D.

---

## CONTACT INFORMATION

*Address and cell number provided on request.*

*Email: [nate@natebird.com](mailto:nate@natebird.com)  
Web: <http://natebird.com>*

## EDUCATION

### **University of Minnesota**, Minneapolis, Minnesota

Ph.D., Computer Science (October 2009)

- Dissertation Title: “Calibration and Component Placement in Structured Light Systems for 3D Reconstruction Tasks”
- Advisor: Nikolaos Papanikolopoulos
- Minor: Psychology
- GPA: 4.0/4.0

M.S., Computer Science (May 2006)

- Thesis Title: “Detection of Loitering Individuals in Public Transportation Areas”
- Advisor: Nikolaos Papanikolopoulos
- Awards: Matthew J. Huber Award for Excellence in Transportation Research and Education, 2005 ITS Student of the Year
- GPA: 4.0/4.0

### **Ohio Northern University**, Ada, Ohio

B.S., Computer Engineering *with High Distinction* (May 2003)

- Minors: Applied Mathematics, Physics
- Honor Societies: Tau Beta Pi, Phi Kappa Phi, Sigma Pi Sigma, Phi Eta Sigma
- GPA: 3.97/4.0

## RESEARCH INTERESTS

Computer vision, 3D reconstruction, visual activity recognition, robotics, machine learning, structured light systems.

## EXPERIENCE

### **Image Sensing Systems, Inc.**, St. Paul, Minnesota

*Principal Algorithm Development Engineer*

**June 2015–October 2017**

- Conceived, designed, planned, implemented, tested, and supported embedded computer-vision detection algorithms for the **Autoscope Vision** product. The Autoscope Vision is a camera-based sensor that monitors traffic at an intersection and sends traffic-light control signals based on the lanes vehicles are detected in. It must work 24/7/365 in all lighting and weather conditions.
- Implemented algorithms from the research literature, modified those algorithms to meet product needs, and built wholly new algorithms.
- Worked closely with other team members to develop hardware specifications, to ensure the algorithms worked with the rest of the system, to modify algorithms to meet real-time processing constraints, and to verify correct operation of the algorithms.
- Facets of computer-vision worked on: computational geometry, behavior recognition, results visualization, recognition and handling of weather conditions, target extraction, tracking, scene calibration, embedded systems, image stabilization, signal processing, and shadow removal.

*Senior Algorithm Development Engineer*

**October 2013–June 2015**

- Developed vision-based vehicle tracking algorithms and supporting technologies for next-generation traffic monitoring and intersection-control devices.

**Birdseye Technology LLC**, Minneapolis, Minnesota

*Proprietor*

**September 2012–September 2013**

- **Birdseye College Price Comparison:** Created a website to provide students with a 4-year total college cost estimate tailored to individual students' circumstances and how their colleges of interest provide financial aid to students with similar background and how tuition has historically been raised year-on-year.

**Ohio Northern University**, Ada, Ohio

*Assistant Professor of Computer Science*

**November 2009–August 2012**

- Courses taught:
  - Introduction to Programming 2 (Java). Spring '11/'12.
  - Data Structures and Algorithms 2. Spring '11/'12, Spring '10/'11, Spring '09/'10.
  - Operating Systems. Spring '11/'12, Spring '10/'11, Spring '09/'10.
  - Computer Security. Fall '11/'12.
  - Programming Languages. Fall '11/'12, Fall '10/'11.
  - Data Structures and Algorithms 1. Fall '11/'12, Winter '10/'11, Winter '09/'10.
  - Computer Vision. Spring '10/'11, Spring '09/'10.
  - Introduction to Programming 2 (C++). Winter '10/'11, Winter '09/'10.
  - Microprocessors. Fall '10/'11.
- Course introduced:
  - Computer Vision.
- Research:
  - Developed algorithms to visually analyze behaviors and detect traitors within multi-robot teams, focusing on behaviors that do not change based on a robot's sensor input.
  - Worked in a team developing a vision system to monitor children for developmental handicaps in a natural school environment, using data captured from multiple overlapping depth+image sensors.
- Committees served:
  - University Council. '10/'11–'11/'12.
  - College Disability Accommodations Appeals Committee. '11/'12.
  - Computer Science Curriculum Committee. '09/'10–'11/'12.
- Student academic advising:
  - Computer Science juniors and seniors. '10/'11–'11/'12.
- Student group advising:
  - ACM student chapter advisor. '10/'11.
  - ACM Programming Competition coach. '10/'11.
- Senior Capstone advising:
  - 2011/2012: Autonomous golf cart (path planning); multi-modal robot.
  - 2010/2011: Autonomous golf cart (electromechanical); networked interactive water fountain displays.

**University of Minnesota**, Minneapolis, Minnesota

*Graduate Research Assistant*

**September 2003–November 2009**

- Developed supporting technology for a full-body patient tracking system for medical applications.

- Developed a large vision-based human activities monitoring system for the Department of Homeland Security, comprising of over 100 cameras and many detected behaviors.
- Developed vision algorithms to detect distracting behavior in motorists.
- Developed a vision system to monitor for suspicious behavior at bus stops.

*Technology Day Camp Co-Coordinator*

**Summer 2008, Summer 2009**

- A week-long day camp to get middle school students from underrepresented backgrounds interested in computer science. Expanded to three weeks in 2009.
- Duties included: planning, developing curriculum, organizing volunteers, and leading the camp.
- For more information on the camp, see <http://techcamp.cs.umn.edu>.

*Teaching Assistant*

**Fall 2006–Spring 2008**

- Computer Vision: Spring 2007/2008.
- Introduction to Programming: Summer 2007.
- Artificial Intelligence 1: Fall 2006/2007, Spring 2006/2007.

JOURNAL  
PUBLICATIONS

N. Bird and N. Papanikolopoulos, “Optimal Image-Based Euclidean Calibration of Structured Light Systems in General Scenes”, *IEEE Trans. Automation Science and Engineering*, vol. 8, no. 4, pp. 815–823, 2011.

K. Cannon, M. A. LaPoint, N. Bird, K. Panciera, H. Veeraraghavan, N. Papanikolopoulos, and M. Gini, “Using Robots to Raise Interest in Technology Among Underrepresented Groups”, *IEEE Robotics and Automation Magazine*, vol. 2, no. 99, pp. 2-11, 2007.

H. Veeraraghavan, N. Bird, S. Atev, N. Papanikolopoulos, and P. Schrater, “Classifiers for Driver Activity Monitoring”, *Transportation Research Part C: Emerging Technologies*, vol. 15, no. 1, pp. 51-67, February 2007.

N. Bird, O. Masoud, N. Papanikolopoulos, and A. Isaacs, “Detection of Loitering Individuals in Public Transportation Areas”, *IEEE Trans. Intelligent Transportation Systems*, vol. 6, no. 2, pp. 167-177, June 2005.

CONFERENCE  
PUBLICATIONS

R. Sivalingam, A. Cherian, J. Fasching, N. Walczak, N. Bird, V. Morellas, B. Murphy, K. Cullen, K. Lim, G. Sapiro, and N. Papanikolopoulos, “A Multi-Sensor Visual Tracking System for Behavior Monitoring of At-Risk Children”, *Proc. IEEE Intl. Conf. Robotics and Automation (ICRA 2012)*, May 2012.

N. Walczak, J. Fasching, W. Toczyski, R. Sivalingam, N. Bird, K. Cullen, V. Morellas, B. Murphy, G. Sapiro, and N. Papanikolopoulos, “A Nonintrusive System for Behavioral Analysis of Children Using Multiple RGB+Depth Sensors”, *Proc. Workshop Applications in Computer Vision (WACV 2012)*, January 2012.

N. Bird, “Use of the Arduino Platform for a Junior-Level Undergraduate Microprocessors Course”, *Proc. ASEE Annual Conf. (ASEE 2011)*, June 2011.

- Finalist for Best Paper in the Computers in Education division.

J. Estell, N. Bird, F. Hassan, “Mentoring with Index Cards: An Early Introduction to Formative Assessment for New Faculty”, *Proc. ASEE Annual Conf. (ASEE 2011)*, June 2011.

N. Bird and N. Papanikolopoulos, “Recognition of Traitors in Distributed Robotic Teams”, *Proc. IEEE Intl. Conf. Robotics and Automation (ICRA 2011)*, May 2011.

N. Bird and N. Papanikolopoulos, “Placement Quality in Structured Light Systems”, *Proc. IEEE/RSJ Conf. Intelligent Robots and Systems (IROS 2009)*, October 2009.

N. Bird, S. Atev, N. Caramelli, R. Martin, O. Masoud, and N. Papanikolopoulos, “Real-Time, Online Detection of Abandoned Objects in Public Areas”, *Proc. IEEE Intl. Conf. Robotics and Automation (ICRA 2006)*, pp. 3775-3780, May 2006.

K. Cannon, M. A. LaPoint, N. Bird, K. Panciera, H. Veeraraghavan, and N. Papanikolopoulos, “No Fear: University of Minnesota Robotics Day Camp Introduces Local Youth to Hands-On Technologies”, *Proc. IEEE Intl. Conf. Robotics and Automation (ICRA 2006)*, pp. 363-368, May 2006.

H. Veeraraghavan, S. Atev, N. Bird, P. Schrater, and N. Papanikolopoulos, “Driver Activity Monitoring through Supervised and Unsupervised Learning”, *Proc. IEEE Conf. Intelligent Transportation Systems (ITSC 2005)*, pp. 895-900, September 2005.

G. Gasser, N. Bird, O. Masoud, and N. Papanikolopoulos, “Human Activities Monitoring at Bus Stops”, *Proc. IEEE Conf. Robotics and Automation (ICRA 2004)*, pp. 90-95, April 2004.

- Finalist for Best Student Paper.

N. Bird, E. Miller, P. Pfeiffer, and S. Vemuru, “Channel Routing with Crosstalk Considerations”, *Proc. Int’l Conf. VLSI*, pp. 119-124, 2003.

VIDEO  
PROCEEDING

S. Herbert, N. Bird, A. Drenner, and N. Papanikolopoulos, “A Search and Rescue Robot”, *Proc. IEEE Conf. Robotics and Automation (ICRA 2009)*, May 2009.

TECHNICAL  
REPORTS

H. Veeraraghavan, S. Atev, N. Bird, P. Schrater, N. Papanikolopoulos, “Finding What the Driver Does”, CTS 05-03, Intelligent Transportation Systems Institute, University of Minnesota, May 2005.

G. Gasser, N. Bird, and N. Papanikolopoulos, “Recognition of Human Activity in Metro Transit Spaces”, CTS 04-02, Intelligent Transportation Systems Institute, University of Minnesota, June 2004.