

# DANICA M. OMMEN

Iowa State University  
Department of Statistics  
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## Professional Experience

Assistant Professor, Department of Statistics, Iowa State University Aug. 2017—present

*Position Responsibility Statement:*

Teaching/Advising: 40%      Research: 35%      Professional Practice: 20%      Service: 5%

*Research Interests:*

Forensic analysis; foundational statistical methodology; Bayesian analysis & model selection; pattern recognition & statistical learning

## Education

*Ph.D. in Computational Science & Statistics* Sept. 2014—Aug. 2017  
South Dakota State University

*M.S. in Mathematics with emphasis in Statistics* Sept. 2012—Aug. 2014  
South Dakota State University

*B.S. in Mathematics* Sept. 2008—May 2012  
South Dakota State University

## Dissertation

**Danica M. Ommen** (2017), Approximate Statistical Solutions to the Forensic Identification of Source Problem, *South Dakota State University Theses and Dissertations*, 1710, <http://openprairie.sdstate.edu/etd/1710>

## Publications

Published: (\*indicates student or post-doc under my supervision)

Amy Crawford\*, **Danica M. Ommen**, and Alicia Carriquiry “A Rotation-Based Feature and Bayesian Hierarchical Model for the Forensic Evaluation of Handwriting Evidence in a Closed Set,” accepted to *Annals of Applied Statistics* (online pre-print available at <https://imstat.org/journals-and-publications/annals-of-applied-statistics/annals-of-applied-statistics-next-issues/>)

Jonathan P. Williams, **Danica M. Ommen**, Jan Hannig, “Generalized Fiducial Factor: an alternative to a Bayes Factor for Forensic Identification of Source Problems,” accepted to *Annals of Applied Statistics* (online pre-print available at <https://imstat.org/journals-and-publications/annals-of-applied-statistics/annals-of-applied-statistics-next-issues/>)

Stephanie Reinders\*, Yong Guan, **Danica M. Ommen**, Jennifer Newman (2022) “Source-Anchored, “Trace-Anchored, and General Match Score-Based Likelihood Ratios for Camera Device Identification” *Journal of Forensic Sciences*, 67:3, pp. 975– 988. <https://doi.org/10.1111/1556-4029.14991>

Madeline Johnson\* and **Danica M. Ommen** (2022) “Handwriting Identification using Random Forests and Score-based Likelihood Ratios” *Statistical Analysis and Data Mining: ASA Data Sci. J.* 15:3, pp. 357– 375. <http://doi.org/10.1002/sam.11566>

**Danica M. Ommen** and Christopher P. Saunders (2022) “Differences between Bayes Factors and Likelihood Ratios for Quantifying the Forensic Value of Evidence,” invited chapter in *Statistics in the Public Interest: In Memory of Stephen E. Fienberg*, Editors: Alicia L. Carriquiry, Judith M. Tanur and William F. Eddy, Springer Cham; Springer Series in the Data Sciences, DOI: <https://doi.org/10.1007/978-3-030-75460-0>

- Danica M. Ommen**, JenaMarie Baldaino, Christopher P. Saunders, Jack Hietpas, and JoAnn Buscaglia (2022) "Characterization and differentiation of aluminum powders used in improvised explosive devices Part 2," *Journal of Forensic Science*, 67, pp. 505-515 <https://doi.org/10.1111/1556-4029.14946> (Official FBI Lab. Div. Research Publication #21-31)
- Cami Fuglsby, Christopher P. Saunders, **Danica M. Ommen**, JoAnn Buscaglia, Michael Caligiuri (2022) "Elucidating the relationships between two automated handwriting feature quantification systems for multiple pairwise comparison" *Journal of Forensic Science*, 67:2, pp. 642-650, <https://doi.org/10.1111/1556-4029.14914> (Official FBI Lab. Div. Research Publication #21-21)
- Danica M. Ommen**, Cami Fuglsby, Michael P. Caligiuri (2021) "Advances Toward Validating Examiner Writership Opinion Based on Handwriting Kinematics," *Forensic Science International*, 318:110644, <http://dx.doi.org/10.1016/j.forsciint.2020.110644>
- JenaMarie Baldaino, **Danica M. Ommen**, Christopher P. Saunders, Jack Hietpas, and JoAnn Buscaglia (2021) "Characterization and differentiation of aluminum powders used in improvised explosive devices Part 1: Proof-of-concept of the utility of particle micromorphometry," *Journal of Forensic Sciences*, 66:1, pp. 83-95, <http://dx.doi.org/10.1111/1556-4029.14564> (Official FBI Lab. Div. Research Publication #20-64)
- Danica M. Ommen** and Christopher P. Saunders (2021) "A Problem in Forensic Science Highlighting the Differences between the Bayes Factor and Likelihood Ratio," *Statistical Science*, 36:3, pp. 344-359, <http://dx.doi.org/10.1214/20-STS805>
- Cami Fuglsby, Christopher P. Saunders, **Danica M. Ommen**, Michael P. Caligiuri (2020), "Use of an Automated System to Evaluate Feature Dissimilarities in Handwriting under a Two-Stage Evaluative Process," *Journal of Forensic Sciences*, 65:6, pp. 2080-2086, <https://doi.org/10.1111/1556-4029.14547> (also featured in *2020 Noteworthy Articles*, [https://onlinelibrary.wiley.com/doi/toc/10.1111/\(ISSN\)1556-4029.2020-noteworthy-articles](https://onlinelibrary.wiley.com/doi/toc/10.1111/(ISSN)1556-4029.2020-noteworthy-articles))
- Danica M. Ommen** and Christopher P. Saunders (2018), Building a Unified Statistical Framework for the Forensic Identification of Source Problems, *Law, Probability, and Risk*, 17:2, pp. 179-197, <https://doi.org/10.1093/lpr/mgy008>
- Danica M. Ommen**, Christopher P. Saunders, and Cedric Neumann (2017), The Characterization of Monte Carlo Errors for the Quantification of the Value of Forensic Evidence, *Journal of Statistical Computation and Simulation*, 87:8, pp. 1608-1643, <https://doi.org/10.1080/00949655.2017.1280036>
- Danica M. Ommen**, Christopher P. Saunders, and Cedric Neumann (2016), An Argument Against Presenting Interval Quantifications as a Surrogate for the Value of Evidence, *Science and Justice*, 56, pp. 383-387, <http://dx.doi.org/10.1016/j.scijus.2016.07.001>

#### Submitted:

- Federico Veneri\* and **Danica M. Ommen**, "Evaluation of Score-based Likelihood Ratios in a Forensic Setting," submitted to *Journal of Statistical Computation and Simulation*
- Xiaochen Zhu, Larry Tang, **Danica M. Ommen**, Elham Tabassi, "Sampling Variabilities of Score-based Likelihood Ratios," rejected with invitation to re-submit to *Science and Justice*
- Hana Lee, Yumou Qiu, **Danica Ommen**, Alicia Carriquiry, "Optimal Matching Rule with Application in Forensic Science" to be submitted to *Annals of Applied Statistics*.

#### In Preparation:

- Amy Crawford\*, Alicia Carriquiry, and **Danica M. Ommen**, "A Bayesian approach to the forensic analysis of handwriting," to be submitted to *Bayesian Analysis* (rejected by PNAS).
- Nathaniel Garton, **Danica M. Ommen**, Jarad Niemi, Alicia Carriquiry, "Score-based likelihood ratios to evaluate forensic pattern evidence," to be submitted to *Statistical Science* (rejected by JRSS-A).

**Danica M. Ommen** and Christopher P. Saunders, “Disambiguating Bayes Factors and Likelihood Ratios for Quantifying the Forensic Value of Evidence,” to be submitted to *Law, Probability, and Risk*.

Nathaniel Garton\* and **Danica M. Ommen**, “Improving Score-based Likelihood Ratios via Stacking,” to be submitted to *Law, Probability, and Risk* (rejected by *Technometrics*).

Pilhyun A. Lim\* and **Danica M. Ommen**, “Twin Convolutional Neural Networks to Classify Writers using Handwriting Data,” to be submitted to *Statistical Analysis and Data Mining: ASA Data Sci. J.*

Gabrielle L. Collins\* and **Danica M. Ommen**, “Quantifying the Value of Forensic Handwriting Evidence using Open-Source Feature Extraction,” to be submitted to *Statistical Analysis and Data Mining: ASA Data Sci. J.*

Anyesha Ray\*, Alicia Carriquiry, and **Danica M. Ommen**, “Statistical Analysis of Handwriting Slant with Respect to Demographic Features,” to be submitted to *Forensic Science International*

Stephanie Reinders\*, **Danica M. Ommen**, and Alicia Carriquiry, “Score-based likelihood ratios for camera device identification using close non-matches,” to be submitted to *Journal of Forensic Sciences*

Federico Veneri\* and **Danica M. Ommen**, “Ensemble of SLR systems for Forensic Evidence” to be submitted to *Statistical Analysis and Data Mining: ASA Data Sci. J.*

## Grants

### Funded:

#### *Accounting for Covariates in Forensic Error Rate Assessment and Evidence Interpretation*

National Institute of Justice, Award # 2019-DU-BX-0011

Liansheng (Larry) Tang, GMU/UCF – Principal Investigator

**Danica Ommen**, ISU – Principal Investigator on sub-award to ISU

Total Funding: \$495,056 (2-year award)

Funding to ISU: \$ 47,647

Project Dates: Sept. 2020 – Aug. 2022

<https://nij.ojp.gov/funding/awards/2019-du-bx-0011>

#### *Statistical Infrastructure for the Use of Error Rate Studies in the Interpretation of Forensic Evidence*

National Institute of Justice, Award # 2018-DU-BX-0228

Liansheng (Larry) Tang, GMU/UCF – Joint-Principal Investigator

**Danica Ommen**, ISU – **Joint-Principal Investigator**

Total Funding: \$197,669 (1-year award)

Funding to ISU: \$ 60,581

Project Dates: Jan. 2019 – Sept. 2019, Sept. 2020 – May 2021

<https://nij.ojp.gov/funding/awards/2018-du-bx-0228>

#### *Kinematic Validation of FDE Determinations about Writership of Questioned Handprinting and Handwriting*

National Institute of Justice, Award # 2017-DN-BX-0148

Michael L. Caligiuri, UCSD – Principal Investigator

**Danica Ommen**, ISU – Principal Investigator on sub-award to ISU

Total Funding: \$464,910 (2-year award)

Funding to ISU: \$ 94,898

Project Dates: Jan. 2018 – Dec. 2019

<https://nij.ojp.gov/funding/awards/2017-dn-bx-0148>

### Submitted Applications:

#### *Development of an Evidence-Based Method for the Examination of Electronic Biodynamic Signatures*

National Institute of Justice, Solicitation # NIJ-2021-95001

Veronica Dahir & Charles Edwards, UNR – Principal Investigator & Co-Principal Investigator

Mara Merlino, KSU – Co-Principal Investigator

**Danica Ommen**, ISU – **Co-Principal Investigator** & PI on subaward to ISU

Total Requested Funding: \$684,444 (\$54,194 to ISU, not funded for FY2021)

*CAREER: A Novel Statistical Framework for Forensic Evidence Interpretation*

National Science Foundation, Solicitation # NSF-20-525

**Danica Ommen**, ISU – **Principal Investigator**

Total Funding to ISU: \$ 462,456 (Not funded for FY2020, will resubmit elsewhere)

## Invited Presentations

- “Forensic Handwriting Identification using Random Forests and Score-based Likelihood Ratios”*  
**Danica Ommen** and Madeline Johnson  
 SDSU 2022 Data Science Symposium; South Dakota State University; Brookings, SD  
 Feb. 2022
- “Constructing Coherent Score-Based Likelihood Ratios that Account for Rarity”*  
**Danica Ommen**, Nate Garton  
 ICSA 2021 Applied Statistics Symposium; International Chinese Statistical Association;  
 Virtual Conference  
 Sept. 2021
- “Development of an Evidence-Based Method for the Examination of Electronic Biodynamic Signatures”* (2-day, 8-hour, invited workshop)  
**Danica Ommen**, Linton Mohammed, Charles Edwards, Veronica Dahir, Mara Merlino,  
 Brent Ostrum  
 ENFHEX (European Network of Forensic Handwriting Experts) Conference;  
 European Network of Forensic Science Institutes; Virtual Conference  
 June 2021
- “Advances toward Validating Examiner Writership Opinion based on Handwriting Kinematics”*  
**Danica Ommen**, Michael Caligiuri, Chris Saunders, Cami Fuglsby, JoAnn Buscaglia  
 ENFHEX (European Network of Forensic Handwriting Experts) Conference;  
 European Network of Forensic Science Institutes; Virtual Conference  
 June 2021
- “Statistical Support for Weight of Evidence Determinations of Handwriting Evidence”*  
**Danica Ommen** and Madeline Johnson  
 ENFHEX (European Network of Forensic Handwriting Experts) Conference;  
 European Network of Forensic Science Institutes; Virtual Conference  
 June 2021
- “A Method of Forensic Evidence Interpretation Using Error Rates”*  
**Danica Ommen**, Larry Tang, and Christopher Saunders  
 ICSA 2020 Applied Statistics Symposium; International Chinese Statistical Association;  
 Virtual Conference  
 Dec. 2020
- “A Method of Forensic Evidence Interpretation Using Error Rates”*  
**Danica Ommen**, Larry Tang, and Christopher Saunders  
 Joint Statistical Meetings 2020; American Statistical Association; Virtual Conference  
 Aug. 2020
- “Which Forensic Likelihood Ratio Approach is Better?”*  
**Danica Ommen** and Peter Vergeer  
 10<sup>th</sup> International Workshop on Simulation and Statistics;  
 Universitat Salzburg; Salzburg, Austria  
 Sept. 2019
- “Which statistical paradigm should I use for forensic evidence interpretation?”*  
**Danica Ommen** and Christopher Saunders  
 ICSA 2019 Applied Statistics Symposium; International Chinese Statistical Association;  
 Raleigh, NC  
 June 2019
- “Different Paradigms of Interpretation for Forensic Value of Evidence Quantification”*  
**Danica Ommen**, Christopher Saunders, Reinoud Stoel, and Peter Vergeer  
 University of North Carolina at Chapel Hill, Department of Statistics and Operations  
 Research, STOR Colloquium; Chapel Hill, NC  
 Nov. 2017
- “Research Overview: Approximate Solutions to the Forensic Identification of Source Problems”*  
**Danica Ommen**  
 Apr. 2017

- Iowa State University Department of Statistics and Center for Statistics and Applications  
in Forensic Evidence Joint-Seminar; Ames, IA (invited interview seminar)
- “Current Research Overview: Strategies for Characterizing Various Aspects of Uncertainty in Forensic Identification of Source Problems”*  
**Danica Ommen** Apr. 2017  
University of Central Florida National Center of Forensic Science and Department of  
Statistics Joint-Seminar; Orlando, FL (invited interview seminar)
- “A South Dakotan’s View on the Difference between the Bayes Factor and the Likelihood Ratio”*  
**Danica Ommen** Feb. 2017  
Netherlands Forensic Institute; The Hague, The Netherlands
- “Research Overview: Approximations to the Value of Evidence for Forensic Identification of Source Problems”*  
**Danica Ommen** Jan. 2017  
South Dakota State University Department of Mathematics and Statistics Seminar;  
Brookings, SD (invited interview seminar)
- “New Approaches to the Quantification of Trace Evidence for Source Identification”*  
**Danica Ommen**, Christopher Saunders, and JoAnn Buscaglia May 2016  
Technical Colloquium: Quantifying the Weight of Forensic Evidence  
International Biometric Performance Testing Conference 2016;  
National Institute of Standards and Technology; Gaithersburg, MA
- Panel on the Use of Interval Quantifications for the Value of Forensic Evidence*  
**Danica Ommen** (panel presenter and discussant) May 2016  
Technical Colloquium: Quantifying the Weight of Forensic Evidence  
International Biometric Performance Testing Conference 2016;  
National Institute of Standards and Technology; Gaithersburg, MA
- “Recent Developments in Approximate Solutions to Forensic Source Identification Problems”*  
**Danica Ommen**, Chris Saunders, and JoAnn Buscaglia July 2015  
Algorithms for Threat Detection Program Review;  
Defense Threat Reduction Agency and the National Science Foundation  
Arlington, VA

## Contributed Presentations

- “Interpretation of Handwriting Evidence Using Error Rates and Score-based Likelihood Ratios”*  
**Danica Ommen**, Larry Tang Aug. 2022  
Joint Statistical Meetings, American Statistical Association; Washington, D.C.
- “Interpretation of Handwriting Evidence Using Error Rates and Score-based Likelihood Ratios”*  
**Danica Ommen**, Larry Tang Aug. 2022  
International Association for Identification’s Educational Conference; Omaha, NE
- “Machine Learning Methods for Dependent Data Resulting from Forensic Evidence Comparisons”*  
**Danica Ommen**, Federico Veneri Aug. 2021  
Joint Statistical Meetings 2021; American Statistical Association; Virtual Conference
- “Pairwise comparison scores for handwritten questioned documents”*  
**Danica Ommen**, Cami Fuglsby, Christopher Saunders, Michael Caligiuri, Feb. 2019  
Linton Mohammed, and JoAnn Buscaglia  
American Academy of Forensic Science Annual Scientific Meeting; Baltimore, MD
- “A Solution to the Forensic Identification of Source Problems using Fiducial Inference”*  
**Danica Ommen**, Jan Hannig, and Jonathan Williams Aug. 2018  
Joint Statistical Meetings; American Statistical Association; Vancouver, BC, Canada

- “How strong is the evidence? And how can you tell?”*  
**Danica Ommen** and Marjan Sjerps  
 2018 ISBA World Meeting, International Society for Bayesian Analysis; Edinburgh, UK Jun. 2018
- “To differentiate or not to differentiate...”*  
**Danica Ommen**, Larry Tang, and Cami Fuglsby  
 Symposium on Error Rates for Evidence Interpretation, Center for Statistical Applications  
 in Forensic Evidence; Arlington, VA Jan. 2018
- “Recent Developments on a Distributional Quantification for the Likelihood Ratio”*  
**Danica Ommen**, Cedric Neumann, and Christopher Saunders  
 International Conference on Forensic Inference and Statistics;  
 South Dakota State University; Minneapolis, MN Sept. 2017
- “Different Paradigms of Interpretation for Forensic Value of Evidence Quantification”*  
**Danica Ommen**, Christopher Saunders, Reinoud Stoel, and Peter Vergeer  
 Joint Statistical Meetings; American Statistical Association;  
 Baltimore, MD (Contributed Presentation) Aug. 2017
- “Information Criteria Approximations to the Value of Evidence for Forensic Identification of  
 Source Problems”*  
**Danica Ommen** and Christopher Saunders  
 Joint Statistical Meetings; American Statistical Association;  
 Chicago, IL (Contributed Presentation) Aug. 2016
- “Convergence of Different Computationally Efficient Approximations of the Weight of the  
 Forensic Evidence”*  
**Danica Ommen**, Doug Armstrong, Cedric Neumann, and Chris Saunders  
 European Academy of Forensic Sciences Conference;  
 European Network of Forensic Science Institutes; Prague, Czech Republic Sept. 2015
- “Convergence of Different Computationally Efficient Approximations of the Weight of the  
 Forensic Evidence”*  
**Danica Ommen**, Chris Saunders, and Cedric Neumann  
 Joint Statistical Meetings; American Statistical Association; Seattle, WA Aug. 2015
- “The Common Source Value of Evidence in the Presence of Uncertainty about the Alternative  
 Source Population”*  
**Danica Ommen**  
 Computational Science and Statistics Seminar; South Dakota State University  
 Brookings, SD Oct. 2014

## Poster Presentations

- “Statistical Infrastructure for the Use of Error Rate Studies in the Interpretation of Forensic  
 Evidence”*  
**Danica Ommen**, Larry Tang, Cami Fuglsby, Christopher Saunders, Susan Vanderplas  
 CSAFE All-Hands Meeting; Ames, IA May 2019
- “Kinematic Validation of FDE Determinations about Writership for Questioned Handprinting  
 and Handwriting”*  
**Danica Ommen**, Michael Caligiuri, Cami Fuglsby, Christopher Saunders, Linton  
 Mohammed  
 CSAFE All-Hands Meeting; Ames, IA May 2019
- “Pairwise Scores for Designing Handwritten Document Comparisons”*  
**Danica Ommen**, Cami Fuglsby, Christopher Saunders, Michael Caligiuri,  
 Linton Mohammed, and JoAnn Buscaglia  
 Forensics@NIST 2018 Conference; Gaithersburg, MD Nov. 2018

- “*Statistical Characterization of Commercial and Home-made Aluminum in Explosives Using Automated Particle Micromorphometry*”  
 JenaMarie Baldaino, **Danica Ommen\***, Cami Fuglsby, Christopher Saunder, Jack Heitpas, and JoAnn Buscaglia\*  
 American Academy of Forensic Science Annual Scientific Meeting; Seattle, WA  
 (\*co-presenters) Feb. 2018
- “*Statistical Characterization of Commercial and Home-made Aluminum in Explosives Using Automated Particle Micromorphometry*”  
 JenaMarie Baldaino\*, **Danica Ommen\***, Cami Fuglsby, Christopher Saunder, Jack Heitpas, and JoAnn Buscaglia  
 Impression, Pattern, and Trace Evidence Symposium; Forensic Technology Center of Excellence; Arlington, VA  
 (\*co-presenters) Jan. 2018
- “*Information Criteria Approximations to the Value of Evidence for Forensic Identification of Source Problems*”  
**Danica Ommen** and Christopher Saunders  
 International Society for Bayesian Analysis 2016 World Meeting;  
 Cagliari, Sardinia, Italy June 2016
- “*The Interpretation and Presentation of Trace Element Analysis of High Purity Copper Evidence*”  
 Chris Saunders, **Danica Ommen\***, Joshua Dettman, and JoAnn Buscaglia  
 European Academy of Forensic Sciences Conference;  
 European Network of Forensic Science Institutes;  
 Prague, Czech Republic Sept. 2015
- “*Computational and Statistical Aspects of the Forensic Identification Source Problem*”  
**Danica Ommen**, Chris Saunders, and Cedric Neumann  
 Joint Statistical Meetings; American Statistical Association;  
 Boston, MA. Aug. 2014

## Research Support

- Center for Statistics and Applications in Forensic Evidence (CSAFE)*  
 National Institute of Standard and Technology (NIST) Center of Excellence  
 Cooperative Agreement #70NANB15H176 & #70NANB20H019 Aug. 2017—Present  
 Alicia Carriquiry, Director
- CSAFE (semi-competitive) Sub-awards with **Danica Ommen**, ISU – **Principal Investigator**  
 Total Funding: \$100,217 (Year 1) + \$92,407 (Year 2) = \$192,624
1. *Machine learning methods for dependent score-data resulting from forensic evidence comparisons*
  2. *Validation and reliability of score-based likelihood ratios for forensic evidence*
  3. *Handwriting Evaluation (co-PI with Alicia Carriquiry)*

## Funded Graduate Research Assistants

- Center for Statistics and Applications in Forensic Evidence*
- |  |                           |
|--|---------------------------|
| Andrew Lim (funded by CSAFE Project #3 above)                            | Spring 2021 – present     |
| Federico Veneri Guarch (funded by CSAFE Project #1 above)                | Summer 2020 – present     |
| Madeline Johnson (funded by CSAFE Project #3 above)                      | Summer 2020 – Spring 2021 |
| Nathaniel Garton (as research advisor only, funded by Alicia Carriquiry) | Fall 2019 – Spring 2020   |

**Advising (in progress)**

Role:	Involvement Dates (Expected Graduation)
<i>Honors Research Mentor</i> Ashlan Simpson – B.S. student (ISU Statistics & Mathematics) Exploration of Forensic Error Rates	Spring 2022 – present (Spring 2023)
<i>Honors Research Mentor (with Alicia Carriquiry)</i> Emily Allen – B.S. student (ISU Department of Statistics) Two-Sample Tests for Analysis of Forensic Signatures and Ink Evidence Recipient of ISU <b>Outstanding FHMP Scholar Award</b> (\$1000), Fall 2022	Spring 2022 – present (Spring 2025)
<i>Major Professor</i> Samuel Fox – M.S. student (ISU Department of Statistics) SIFT/SURF for Forensic Handwriting Identification	Fall 2021 – present (Fall 2022)
<i>Co-Major Professor (with Alicia Carriquiry)</i> Alexandra Arabio – M.S. student (ISU Department of Statistics) Kneser Graph Analysis of Forensic Handwriting Evidence	Fall 2021 – present (Summer 2023)
<i>Co-Major Professor (with Alicia Carriquiry)</i> Anyesha Ray – M.S. student (ISU Department of Statistics) Bayesian Analysis of Writing Slant to Predict Writer Demographics	Fall 2021 – present (Summer 2023)
<i>Major Professor</i> Federico Veneri Guarch – Ph.D. student (ISU Department of Statistics) Machine Learning Methods for Pairwise/Dependent Forensic Data	Summer 2020 – present (Spring 2024)
<i>Major Professor</i> Andrew (Pilhyun) Lim – Ph.D. student (ISU Department of Statistics)	Spring 2022—present (Spring 2025)
<i>POS Committee member</i> Wangqian (Will) Ju – Ph.D. student ISU Department of Statistics	Summer 2022 – present (Summer 2024)
<i>POS Committee member</i> Eryn Blagg – Ph.D. student ISU Department of Statistics	Summer 2022 – present (Summer 2023)
<i>POS Committee member</i> Hana Lee – Ph.D. student ISU Department of Statistics	Spring 2022 – present (Spring 2023)
<i>POS Committee member</i> Valerie Han – M.S. student ISU Department of Statistics	Fall 2021 – present (Fall 2022)
<i>POS Committee member</i> Mehrnoosh Taghavimehr – Ph.D. student ISU Department of Mechanical Engineering (with Statistics Minor)	Spring 2022 – present (Summer 2024)
<i>POS Committee member</i> Paul Morris – Ph.D. student ISU Department of Statistics	Fall 2021 – present (Summer 2023)
<i>POS Committee member</i> Coskun Erden – M.S. student ISU Department of Statistics	Fall 2021 – present (Fall 2022)
<i>POS Committee member</i> Joseph Zemmels – Ph.D. student ISU Department of Statistics	Summer 2021 – present (Spring 2023)

<p><i>POS Committee member</i>          Abby Martin – Ph.D. student          ISU Departments of Mathematics and Computer Science (co-major)</p>	<p>Summer 2020 – present          (Spring 2023)</p>
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### Advising (completed)

Role:	Graduation Date
<i>Major Professor</i>	
Gabrielle Collins – M.S. STAT <i>Data Science Technology Consultant at Ernst &amp; Young</i>	Spring 2022
Andrew (Pilhyun) Lim – M.S. STAT <i>Pursuing Ph.D. in Statistics at Iowa State University</i>	Spring 2022
Federico Veneri Guarch – M.S. STAT <a href="https://dr.lib.iastate.edu/handle/20.500.12876/7wbOPGNv">https://dr.lib.iastate.edu/handle/20.500.12876/7wbOPGNv</a> <i>Pursuing Ph.D. in Statistics at Iowa State University</i>	Spring 2021
Madeline Johnson – M.S. STAT <a href="https://dr.lib.iastate.edu/handle/20.500.12876/qzXBxJLv">https://dr.lib.iastate.edu/handle/20.500.12876/qzXBxJLv</a> <i>Biostatistician at Boston Scientific</i>	Spring 2021
<i>Co-Major Professor</i>	
Amy Crawford (with Alicia Carriquiry) – Ph.D. STAT <a href="https://dr.lib.iastate.edu/handle/20.500.12876/32261">https://dr.lib.iastate.edu/handle/20.500.12876/32261</a> <i>Statistical Scientist at Berry Consultants, LLC</i>	Spring 2020
Miranda Tilton (with Susan Vanderplas) – M.S. STAT <a href="https://dr.lib.iastate.edu/handle/20.500.12876/16806">https://dr.lib.iastate.edu/handle/20.500.12876/16806</a> <i>Pursued Ph.D. in Statistics at Iowa State University</i>	Spring 2019
Soyoung Park (with Alicia Carriquiry) – Ph.D. STAT <a href="https://dr.lib.iastate.edu/handle/20.500.12876/30831">https://dr.lib.iastate.edu/handle/20.500.12876/30831</a> <i>Assistant Professor at Pusan National University</i>	Summer 2018
<i>POS Committee member</i>	
Mohammad Fili – M.S. STAT	Summer 2022
Troy Ness – M.S. STAT	Summer 2022
Abigail Collins – M.S. STAT	Summer 2022
Shaurya Purohit – M.Eng. ECpE (STAT minor)	Summer 2022
Miranda Tilberg (née Tilton) – Ph.D. STAT	Spring 2022
Blake Kassmeyer – M.S. STAT	Spring 2022
Haley Jeppson – Ph.D. STAT	Spring 2022
Katherine Goode – Ph.D. STAT	Summer 2021
Mohammad (Mohsen) Shahhosseini – Ph.D. IMSE (STAT Minor)	Summer 2021
Vahid Azizi – Ph.D. IMSE (STAT Minor)	Summer 2021
Fan Dai – Ph.D. STAT	Summer 2020
Xiaoshan Feng – M.Eng. CCEE (STAT Minor)	Spring 2020
Joseph Zemmels – M.S. STAT	Spring 2020
Eryn Blagg – M.S. STAT	Spring 2020
Stephanie Reinders – Ph.D. MATH & ECpE (STAT Minor)	Spring 2020
Geetika Singh – M.S. ECpE (STAT Minor)	Spring 2020
Martin Silerio Vazquez – M.S. STAT	Spring 2020

### Teaching

Course	Evaluation Scores (LAS Instructor/Course)
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STAT 341 - <i>Introduction to the Theory of Probability and Statistics I</i> (1 section, 4 cr. – 3 days/week lecture + 1 day/week lab) Fall 2022 Spring 2022	4.39/4.27 (n=33/38)
STAT 590 B - <i>Special Topics: Statistical Methods for Forensic Science Applications</i> (1 section, 3 cr.) Fall 2021	5.00/4.78 ( n = 9/9 )
STAT 104 - <i>Introduction to Statistics</i> (1 section, 3 cr.) Fall 2020 Fall 2018 Fall 2017	NA*/4.42 (n=19/56) 3.35/3.15 (n=26/55) 3.64/3.42 (n=33/56)
STAT 544 - <i>Bayesian Statistics</i> (1 section, 3 cr.) Spring 2023 Spring 2022 Spring 2021 Spring 2020	4.85/4.69 (n=13/17) NA*/4.10 (n=10/22) NA*/5.00 ( n = 2/7 )
STAT 588 - <i>Statistical Theory for Research Workers</i> (1 section, 4 cr.) Spring 2023 Spring 2021 Spring 2020 Fall 2019 Spring 2019	NA*/4.71 (n=14/27) NA*/4.83 (n=12/21) 4.75/4.50 (n=16/22) 4.44/4.44 (n=16/24)
STAT 226 - <i>Introduction to Business Statistics</i> (1 section, 3 cr.) Spring 2018	2.76/2.62 (n=29/66)

\*The LAS instructor question was removed from evaluations during the COVID-19 pandemic

### Departmental Service

Search Committee for STAT Dept. Assistant Professor	AY 2021-2022
Future of Written Exams Committee member	AY 2021-2022
Snedecor Sustainability Committee member	AY 2020-2021
Seminar Coordinator	Spring 2020
Honors and Awards Committee member	AY 2018-2019 AY 2019-2020 AY 2020-2021
Social Committee member	AY 2017-2018
Search Committee for CSAFE Research Assistant Professor	AY 2017-2018

### Professional Development

Project LEA/RN Workshop	May 15-16, 2019
Writing Winning Grant Proposals Phase 2 Workshop	Spring 2019
Science Communication: An Introduction to the Alan Alda Method Workshop	Feb. 5, 2019
Writing Winning Grant Proposals Workshop	Nov. 8, 2017

**Professional Service**Committee Work:

<i>American Statistical Association (ASA) Advisory Committee on Forensic Science</i> Committee member <a href="https://ww2.amstat.org/committees/commdetails.cfm?txtComm=CCNARS07">https://ww2.amstat.org/committees/commdetails.cfm?txtComm=CCNARS07</a>	Jan. 2021 – Present (Vice Chair – 2022)
<i>NIST Organization of Scientific Area Committees (OSAC) for Forensic Science</i> Ignitable Liquids, Explosives, & Gunshot Residue Subcommittee Member <a href="https://www.nist.gov/osac/ignitable-liquids-explosives-gunshot-residue-subcommittee">https://www.nist.gov/osac/ignitable-liquids-explosives-gunshot-residue-subcommittee</a> Statistics Task Group (STG) Member <a href="https://www.nist.gov/osac/statistics-task-group">https://www.nist.gov/osac/statistics-task-group</a>	Oct. 2019 – Present (Secretary of STG – 2021) (Chair of STG – 2022)
<i>Federal Bureau of Investigation Laboratory Division</i> <i>Research and Support Unit</i> (formerly the Counterterrorism and Forensic Science Research Unit) Provide statistical support to various research projects	May 2015 – Present
<i>Expert Working Group on Human Factors for Handwriting Examination</i> <i>National Institute of Standards and Technology/National Institute of Justice</i> Provided statistical support to the group as a volunteer contributor <a href="https://nvlpubs.nist.gov/nistpubs/ir/2020/NIST.IR.8282.pdf">https://nvlpubs.nist.gov/nistpubs/ir/2020/NIST.IR.8282.pdf</a>	June 2015 – Dec. 2019

Conference Organization:

<i>The 11<sup>th</sup> International Conference on Forensic Inference and Statistics</i> Scientific Committee member	March 2019 – Present
<i>South Dakota State University Data Science Symposium 2020</i> Scientific Committee member & Chair of invited speaker session	Nov. 2019 – Feb. 2020
<i>Session Chair</i> Statistical Foundations – Score-based Likelihood Ratios Session International Conference on Forensic Inference and Statistics; South Dakota State University; Minneapolis, MN	Sept. 2017
Facilitated the Handwriting Modality Panel discussions <i>Symposium on Improving Biometric and Forensic Technology: The Future of Research Datasets</i> National Institute of Standards and Technology; Gaithersburg, MD	Jan. 2015

Peer Review:

<i>Science and Justice</i>	1 paper in 2022 2 papers in 2021
<i>Forensic Chemistry</i>	1 paper in 2021 1 paper in 2020
<i>Journal of the American Statistical Association</i>	1 paper in 2020
<i>Bayesian Analysis</i>	1 paper in 2020 1 paper in 2021
<i>Law, Probability, and Risk</i>	2 papers in 2022 1 paper in 2021 1 paper in 2020 1 paper in 2019
<i>Journal of the American Society of Questioned Document Examiners</i> Editorial Review Board member (Jan. 2019 – Present)	1 paper in 2019

*Journal of Forensic Sciences*

2 papers in 2021  
1 paper in 2019  
2 papers in 2018  
1 paper in 2016

### Memberships to Academic Societies

American Statistical Association	Jan. 2018—Present
International Society for Bayesian Analysis	Jan. 2016—Present
Institute of Mathematical Statistics	Jan. 2014—Present
Golden Key National Honour Society	Sept. 2010—Present

### Awards & Honors

Stephen E. Fienberg CSAFE Young Investigator Award	Sept. 2017
Stephen E. Fienberg CSAFE Young Investigator Travel Award - \$1500	June 2017

### Co-Authored Presentations (\* indicates presenter)

<p><i>“Ensemble of SLR Systems for Forensic Evidence”</i> Federico Veneri* and <b>Danica Ommen</b> Joint Statistical Meetings, American Statistical Association; Washington, D.C. <b>2<sup>nd</sup> place winner of the 2022 JSM Statistical Significance Poster Competition</b></p>	Aug. 2022
<p><i>“Assessing the Dependency Structure Between Shape Codes for Forensic Handwriting Data”</i> Cami Fuglsby*, Kayla M. Moquin, Christopher P. Saunders, <b>Danica Ommen</b>, Michael Caliguiri, JoAnn Buscaglia American Academy of Forensic Science Annual Scientific Meeting; Seattle, WA (Poster)</p>	Feb. 2022
<p><i>“Score-Based Likelihood Ratios for Camera Device Identification Using Cameras of the Same Brand for the Alternative Device Population”</i> Stephanie Reinders*, <b>Danica Ommen</b>, Alicia Carriquiry American Academy of Forensic Science Annual Scientific Meeting; Seattle, WA</p>	Feb. 2022
<p><i>“Ensemble of SLR Systems for Forensic Evidence”</i> Federico Veneri*, <b>Danica Ommen</b> American Academy of Forensic Science Annual Scientific Meeting; Seattle, WA (Poster)</p>	Feb. 2022
<p><i>“The Forensic Discrimination of Aluminum Sources in Improvised Explosive Devices (IEDs) Using Quantitative Trace Elemental Analysis”</i> Anjuli Bhandari*, Michelle Jordan, Christopher Saunders, <b>Danica Ommen</b>, JoAnn Buscaglia American Academy of Forensic Science Annual Scientific Meeting; Seattle, WA</p>	Feb. 2022
<p><i>“Automated Particle Micromorphometry and Statistical Scoring for Improved Characterization of Aluminum (Al) Powders in Improvised Explosive Devices (IEDs)”</i> Kayla Moquin*, Cami Fuglsby, JenaMarie Baldaino, <b>Danica Ommen</b>, Christopher Saunders, Jack Hieptas, JoAnn Buscaglia American Academy of Forensic Science Annual Scientific Meeting; Seattle, WA (Poster)</p>	Feb. 2022
<p><i>“Generalized Fiducial Factor: An Alternative to the Bayes Factor for Forensic Identification of Source Problems”</i> Jonathan Williams*, <b>Danica Ommen</b>, Jan Hannig Joint Statistical Meetings, American Statistical Association; Virtual Conference</p>	Aug. 2021

- “Increasing the Transparency of Black-Box Systems”*  
Cami Fuglsby\*, Christopher Saunders, **Danica Ommen**, JoAnn Buscaglia, Michael Caligiuri  
Joint Statistical Meetings, American Statistical Association; Virtual Conference Aug. 2021
- “An Evaluation of Score-Based Likelihood Ratios (SLRs) for Glass Data”*  
Federico Veneri\* and **Danica Ommen**  
American Academy of Forensic Science Annual Scientific Meeting; held virtually (Poster) Feb. 2021
- “Quantitative Support for Forensic Document Examination in an Open Set using Random Forests”*  
Madeline Q. Johnson\*, **Danica Ommen**, and Alicia L. Carriquiry  
American Academy of Forensic Science Annual Scientific Meeting; held virtually (Poster) Feb. 2021
- “Relationships between Handwriting Slant and Demographics”*  
Anyesha Ray\*, Alicia L. Carriquiry, and **Danica Ommen**  
American Academy of Forensic Science Annual Scientific Meeting; held virtually (Poster) Feb. 2021
- “Bayesian Characterizations of U-processes Used in Pattern Recognition with Application to Forensic Source Identification”*  
Christopher Saunders\*, Cami Fuglsby, **Danica Ommen**, Joann Buscaglia  
ICSA 2020 Applied Statistics Symposium; International Chinese Statistical Association; Virtual Conference Dec. 2020
- “Statistical Analysis of Handwriting: Probabilistic Outcomes for Closed-Set Writer Identification”*  
Amy Crawford\*, Alicia Carriquiry, **Danica Ommen**  
American Academy of Forensic Science Annual Scientific Meeting; Anaheim, CA Feb. 2020
- “The Interaction of Writing Profiles and Automated Scoring Rules”*  
Cami Fuglsby\*, Michael Caligiuri, **Danica Ommen**, Chris Saunders, JoAnn Buscaglia  
American Academy of Forensic Science Annual Scientific Meeting; Anaheim, CA Feb. 2020
- “Further development of scoring rules for sample comparisons using automated particle micromorphometry of aluminum (Al) powders”*  
Kayla Moquin\*, Cami Fuglsby\*, JenaMarie Baldaino, **Danica Ommen**, Christopher Saunders, Jack Hieptas, JoAnn Buscaglia  
American Academy of Forensic Science Annual Scientific Meeting; Anaheim, CA (Poster) Feb. 2020
- “The Confidence Interval for the Likelihood Ratio with Application to Biometrics”*  
Larry Tang\*, **Danica Ommen**, Elham Tabassi, Xiaochen Zhu  
10<sup>th</sup> International Workshop on Simulation and Statistics;  
Universitat Salzburg; Salzburg, Austria (Invited Presentation) Sept. 2019
- “The Incorporation of U-processes for Bayesian Approaches to Pattern Recognition with Application to Forensic Source Identification”*  
Cami Fuglsby, Chris Saunders\*, **Danica Ommen**, JoAnn Buscaglia  
10<sup>th</sup> International Workshop on Simulation and Statistics;  
Universitat Salzburg; Salzburg, Austria (Invited Presentation) Sept. 2019
- “A Class of Score Functions for the Analysis of Kinematic Handwriting Data”*  
Cami Fuglsby\*, Christopher Saunders, **Danica Ommen**, Michael Caligiuri  
10<sup>th</sup> International Workshop on Simulation and Statistics;  
Universitat Salzburg; Salzburg, Austria (Poster) Sept. 2019
- “A Bayesian Hierarchical Model for Forensic Writer Identification”*  
Amy Crawford\*, Alicia Carriquiry, **Danica Ommen**  
10<sup>th</sup> International Workshop on Simulation and Statistics;  
Universitat Salzburg; Salzburg, Austria (Poster) Sept. 2019
- “The Development of Score Functions for the Analysis of Kinematic Handwriting Data”*  
Cami Fuglsby\*, Chris Saunders, **Danica Ommen**, Michael Caligiuri Sept. 2019

Department of Mathematics & Statistics Seminar;  
South Dakota State University; Brookings, SD

- “Statistical Analysis of Handwriting for Writer Identification”*  
Amy Crawford\*, Nick Berry, Alicia Carriquiry, **Danica Ommen**  
American Society of Questioned Document Examiners (ASQDE) Annual Meeting  
Cary, NC Aug. 2019
- “A Bayesian Hierarchical Mixture Model with Applications in Forensic Handwriting Analysis”*  
Amy Crawford\*, Nick Berry, Alicia Carriquiry, **Danica Ommen**  
Joint Statistical Meetings, American Statistical Association; Denver, CO July 2019
- “Forensic Analysis of Handwriting”*  
Alicia Carriquiry\*, Amy Crawford, Nick Berry, **Danica Ommen**  
VI Latin American Meeting of Bayesian Statistics (VI COBAL); Lima, Peru July 2019
- “New Developments in the Interpretation of Pairwise Comparison Procedures for a Class of Forensic Applications Related to Improvised Explosive Devices”*  
Cami Fuglsby\*, Christopher P. Saunders, **Danica Ommen**, JenaMarie Baldaino, JoAnn Buscaglia, Jack Hietpas  
University of Kentucky Department of Statistics Seminar; Lexington, KY Feb. 2019
- “On the Development of Score Rules for the Pairwise Sample Comparison of Particle Micromorphometry of Aluminum (Al) Powders”*  
Cami Fuglsby, **Danica Ommen**, JenaMarie Baldaino, Jack Hietpas, Christopher Saunders\*, and JoAnn Buscaglia\*  
American Academy of Forensic Science Annual Scientific Meeting; Baltimore, MD Feb. 2019
- “Exploratory Analysis of Handwriting Features: Investigating Numeric Measurements of Writing”*  
Amy Crawford\*, Nick Berry, Alicia Carriquiry, **Danica Ommen**  
American Academy of Forensic Science Annual Scientific Meeting; Baltimore, MD Feb. 2019
- “Characterization of commercial and home-made aluminum powders via micromorphometric analysis”*  
JenaMarie Baldaino, **Danica Ommen**, Cami Fuglsby, Christopher Saunders, Jack Hietpas, and JoAnn Buscaglia\*  
European Academy of Forensic Sciences Conference;  
European Network of Forensic Science Institutes; Lyon, France Aug. 2018
- “FDE Conclusion Scales: Rev. Bayes or Prof. Kirk? (Part 1)”*  
Linton Mohammed\*, Cami Fuglsby, Christopher Saunders, **Danica Ommen**, Michael Caligiuri, and JoAnn Buscaglia  
Annual General Meeting of the American Society of Questioned Document Examiners;  
ASQDE and Southwestern Association of Forensic Document Examiners; Park City, UT Aug. 2018
- “FDE Conclusion Scales: Rev. Bayes or Prof. Kirk? (Part 2)”*  
Linton Mohammed, Cami Fuglsby\*, Christopher Saunders, **Danica Ommen**, Michael Caligiuri, and JoAnn Buscaglia  
Annual General Meeting of the American Society of Questioned Document Examiners;  
ASQDE and Southwestern Association of Forensic Document Examiners; Park City, UT Aug. 2018
- “A Modified Two-Stage Approach to the Interpretation of Forensic Evidence”*  
Cami Fuglsby\*, Christopher Saunders, **Danica Ommen**, and JoAnn Buscaglia  
Joint Statistical Meetings, American Statistical Association  
Vancouver, BC, Canada Aug. 2018
- “On the use of Bayesian p-Values for Forensic Identification of Source Problems”*  
Cami Fuglsby\*, Christopher Saunders, **Danica Ommen**, and JoAnn Buscaglia  
2018 ISBA World Meeting, International Society for Bayesian Analysis  
Edinburgh, UK Jun. 2018

- “Several approaches to the LR: which is better?”*  
Peter Vergeer\* and **Danica Ommen**  
International Conference on Forensic Inference and Statistics;  
South Dakota State University; Minneapolis, MN  
Sept. 2017
- “Approximate Bayesian Computation in Forensic Science”*  
Jessie Hendricks\*, Cedric Neumann, Christopher Saunders, and **Danica Ommen**  
International Conference on Forensic Inference and Statistics;  
South Dakota State University; Minneapolis, MN  
Sept. 2017
- “Characterization of Aluminum Powders in Explosives Utilizing Particle Micromorphometry”*  
JenaMarie Baldaino\*, **Danica Ommen**, Cami Fuglsby, Christopher Saunders, Jack Hietpas, and JoAnn Buscaglia  
International Conference on Forensic Inference and Statistics;  
South Dakota State University; Minneapolis, MN (Poster)  
Sept. 2017
- “On the Different Classes of Forensic Identification of Source Problems”*  
**Danica Ommen**, Christopher Saunders\*, and Cedric Neumann,  
Joint Statistical Meetings; American Statistical Association;  
Chicago, IL  
Aug. 2016
- “Characterization of Aluminum (Al) Powders in Explosives Utilizing Particle Micromorphometry”*  
JenaMarie Baldaino\*, **Danica Ommen**, Joshua Dettman, Raleigh Parrott II, Jack Hietpas, and JoAnn Buscaglia  
American Academy of Forensic Sciences Annual Scientific Meeting; Las Vegas, NV  
Feb. 2016
- “Convergence of Score-based Likelihood Ratios in Forensic Science”*  
Madeline Ausdemore, Jessie Hendricks, Damon Bayer, Doug Armstrong, **Danica Ommen**, Cedric Neumann\*, Christopher Saunders, and Jeannette Leegwater  
International Fingerprint Research Group; Patiala, India  
Oct. 2015
- “Automated micromorphometry for the characterization of aluminum powders in explosives”*  
Jack Hietpas\*, Joshua Dettman, Raleigh Parrott II, JoAnn Buscaglia, JenaMarie Baldaino, and **Danica Ommen**  
European Academy of Forensic Sciences Conference;  
European Network of Forensic Science Institutes; Prague, Czech Republic  
Sept. 2015
- “Derivation of Score-based LRs and Evaluation of their Approximation of the Forensic Value of Evidence”*  
Doug Armstrong\*, Jeannette Leegwater, **Danica Ommen**, Wei Huang, Cedric Neumann, and Christopher Saunders  
European Academy of Forensic Sciences Conference;  
European Network of Forensic Science Institutes; Prague, Czech Republic  
Sept. 2015
- “Characterization of Aluminum Powders in Explosives Utilizing Particle Micromorphometry”*  
JenaMarie Baldaino\*, **Danica Ommen**, Christopher Saunders, Joshua Dettman, Raleigh Parrott II, Jack Hietpas, and JoAnn Buscaglia  
Impression Pattern and Trace Evidence Symposium; National Institute of Justice;  
San Antonio, TX (Poster)  
Aug. 2015
- “Developing Appropriate Score-based LRs; the Example of Fingerprints”*  
Doug Armstrong\*, Cedric Neumann, Chris Saunders, **Danica Ommen**, Austin O’Brien  
International Conference on Forensic Inference and Statistics;  
Netherlands Forensic Institute; Leiden, Netherlands (Contributed Poster)  
Aug. 2014
- “Computational and Statistical Aspects of the Forensic Identification of Source Problem: The Specific Source Problem from a Forensic Point of View”*  
**Danica Ommen**, Chris Saunders\*, and Cedric Neumann  
International Conference on Forensic Inference and Statistics;  
Netherlands Forensic Institute; Leiden, Netherlands (Contributed Presentation)  
Aug. 2014

- “Computational and Statistical Aspects of the Forensic Identification of Source Problem: Asymptotic Properties of the Estimated Bayes Factor”*  
**Danica Ommen**, Chris Saunders\*, and Cedric Neumann  
University of Salzburg; Salzburg, Austria (Invited Presentation) Aug. 2014
- “Computational and Statistical Aspects of the Forensic Identification of Source Problem: A General Overview”* (Invited Presentation)  
**Danica Ommen**, Chris Saunders\*, and Cedric Neumann  
Algorithms for Threat Detection Program Review  
Defense Threat Reduction Agency and the National Science Foundation  
Boulder, CO Mar. 2014