

# MEHDI DAGDOUG

## PERSONAL INFORMATION

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Born on March 6, 1996

Nationality: French

### Personal details

Address: 1415 Rue du Fort, Montréal, Québec, Canada, H3H 0C5

Phone : +1 613 252 6185

## CURRENT SITUATION

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**Assistant Professor** in the Department of Mathematics and Statistics at McGill University

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Webpage: <https://mehdidagdoug.github.io>

## EDUCATION

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**2019–2022:** Ph.D. in Mathematics under the supervision of Camelia Goga (Université de Bourgogne Franche-Comté) and David Haziza (University of Ottawa) at the University Bourgogne Franche-Comté. Thesis entitled "Statistical learning for high-dimensional sampling", defended on July 12, 2022.

**2017-2019:** Master of Science in Statistical Modeling, option Research in Statistics at the University of Franche-Comté.

**2014-2017:** Bachelor in Mathematics, option Applied Mathematics at the University of Franche-Comté.

## PROFESSIONAL EXPERIENCE

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<b>Assistant Professor</b>	01/08/2023 - Present
<i>McGill University, Department of Mathematics and Statistics</i>	<i>Montréal, Canada</i>

Assistant professor in the Department of Mathematics and Statistics, Tenure-track position.

<b>Postdoctoral researcher in statistics</b>	01/11/2022 - 31/07/2023
<i>University of Ottawa, Department of Mathematics and Statistics</i>	<i>Ottawa, Canada</i>

Postdoctoral fellowship supervised by Professor David Haziza.

<b>Attaché temporaire d'enseignement et de recherche</b>	01/09/2022 - 31/10/2022
<i>Laboratory of Mathematics of Besançon</i>	<i>Besançon, France</i>

Temporary professor position for teaching and research at the Université de Franche-Comté.

<b>Ph.D. student with teaching contract</b>	01/10/2019 - 31/08/2022
<i>Laboratory of Mathematics of Besançon</i>	<i>Besançon, France</i>

Ph.D. scholarship funded by the Région Bourgogne Franche-Comté and Médiamétrie. Research and teaching activities for the Université de Franche-Comté.

## Research internship

Laboratory of Mathematics of Besançon

Besançon, France

01/03/2019 - 31/08/2019

Redaction of a Master's thesis entitled "Model-assisted approaches and nonresponse in survey sampling" under the supervision of Professor Camelia Goga (Université de Bourgogne Franche-Comté).

## Data scientist intern

Airbus

Toulouse, France

01/04/2018 - 31/08/2018

Research and development for anomaly detection for avionics data with semi-supervised statistical learning models.

## AWARDS AND HONORS

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- 2023: Laureate of the first edition of the Jean-Claude Deville Prize of the French Statistical Society. This prize rewards a young statistician, aged 35 maximum, who has produced an article in a statistical journal for its scientific and methodological qualities as well as its innovative aspects.

## FUNDING HISTORY

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- 2024 - 2029: **NSERC Discovery Grant**. Amount: 162 500 CAD. Title: "Statistical learning for high-dimensional survey sampling".
- October 2023 - October 2028: **Mitacs Accelerate Proposal**. Amount: 315 000 CAD. Co-investigator with David Haziza. Title: "Statistical learning procedures for the treatment of unit and item nonresponse in surveys".
- August 2023: **Start-up grants**. Amount: 150 000 CAD.

## RESEARCH AREAS

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My main research interests are focused on the following areas:

- Survey sampling theory: model-assisted estimation, high-dimensional asymptotic theory, variance estimation.
- Nonresponse in surveys: imputation, weighting methods, variance estimation.
- Statistical learning and its applications in survey sampling and missing data.
- Resampling methods (e.g., Jackknife, cross-validation, bootstrap).

## PEER-REVIEWED ARTICLES

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1. Dagdoug, M., Goga, C., & Haziza, D. (2023). Model-assisted estimation in high-dimensional settings for survey data. *Journal of Applied Statistics*, 50(3), 761-785. Link: <https://doi.org/10.1080/02664763.2022.2047905>.
2. Dagdoug, M., Goga, C., & Haziza, D. (2023). Model-assisted estimation through random forests in finite population sampling. *Journal of the American Statistical Association*, 118(542), 1234-1251. Link: <https://doi.org/10.1080/01621459.2021.1987250>.
3. Dagdoug, M., Goga, C., & Haziza, D. (2023). Imputation procedures in surveys using nonparametric and machine learning methods: an empirical comparison. *Journal of Survey Statistics and Methodology*, 11(1), 141-188. Link: <https://doi.org/10.1093/jssam/smab004>.
4. Eustache, E., Dagdoug, M., & Haziza, D. (2024+). On high-dimensional variance estimation in survey sampling. In revision for *Scandinavian Journal of Statistics*.
5. Larbi, K., Tsang, J., Haziza, D. & Dagdoug, M. (2024). On the use of machine learning methods for the treatment of unit nonresponse in surveys. Accepted for publication in *Survey Methodology*.

6. Dagdoug, M., Goga, C., & Haziza, D. (2024+). Statistical inference in the presence of imputed survey data through regression trees and random forests. In minor revision for *Scandinavian Journal of Statistics*.

## **SUPERVISION: CURRENT STUDENTS**

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- Ph.D. students:
  - An Ziming, University of Ottawa (joint supervision with David Haziza). 01/08/2023 - Present.
  - John Tsang, University of Ottawa (joint supervision with David Haziza). 01/08/2023 - Present.
- M. Sc. Students:
  - Evelyn Hubbard, McGill University (joint supervision with Abbas Khalili). 01/09/2024 - Present.
  - Gulliver Hager, McGill University. 01/09/2024 - Present.
  - Mila Pourali, McGill University. 01/09/2024 - Present.
- Internships:
  - Enzo Abdallah-Herve, student at École Normale Supérieure Paris-Saclay, April - July 2024.
  - Kalil Bouhadra: student at École Polytechnique Fédérale de Lausanne (EPFL), from March - May 2024.

## **TEACHING CURRICULUM**

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### **Teaching at McGill University:**

- Winter 2025:
  - MATH 525 (Sampling Theory and Applications).
  - MATH 470 (1 project).
  - MATH 410 (1 project).
- Fall 2024:
  - MATH 533 (Regression and Analysis of Variance).
  - Research course in statistics: matrix completion and missing data. Master 2, in December 2025 at the University of Bourgogne Franche-Comté. Lectures, exercise, and coding sessions (15 hours).
- Summer 2024: MATH 470 (3 projects).
- Winter 2024: MATH 525 (Sampling Theory and Applications).
- Fall 2023:
  - MATH 533 (Regression and Analysis of Variance).
  - MATH 470 (1 project).

### **Teaching at the Université de Franche-Comté:**

- Teaching in a Master of Science at the Université de Franche-Comté:
  - 2022: Research in statistics in master 2. Lectures, exercise, and coding sessions (15 hours).

- 2020-2022: Survey sampling in master 2. Lectures, exercise, and coding sessions (18 hours) in 2023 and exercise and coding sessions (12 hours) in 2020 and 2021.
- 2021: Statistical learning in master 2. Exercise and coding sessions (6 hours, each year).
- 2020-2022: Python in master 2. Exercise and coding sessions (6 hours, each year).
- 2019-2021: Oriented-Object programming in master 1. Lectures, exercise, and coding sessions (15 hours, each year).
- 2019-2021: Advanced R course in master 1. Lectures and coding sessions (12 hours, each year).
- Teaching in a Bachelor of Science:
  - Elementary statistics in the third year of a bachelor of mathematics. Coding sessions and final projects (25 hours).
  - Mathematical tools in the first year of bachelor of biology. Mixed (40 hours in 2019-2020, 20 hours in 2020-2021).

## PRESENTATIONS AT CONFERENCES AND SEMINARS

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### Invited Conferences

- Dagdoug, M. (2024). High-dimensional variance estimation for model-assisted and imputed estimators. *Bank of Canada Workshop: Understanding and Correcting for Non-response Bias*, Ottawa, Canada, 9 December 2024.
- Dagdoug, M. (2024). Variance estimation for survey estimators based on statistical learning models. *CANSSI-CRT Workshop on Modern Methods in Survey Sampling*, Ottawa, Canada, 8 - 10 July 2024.
- Dagdoug, M., Eustache, E. Haziza, D. (2024). High-dimensional variance estimation in survey sampling. *SIS 2024*, Bari, Italy, 17 - 20 June 2024.
- Dagdoug, M., Eustache, E. Haziza, D. (2024). Variance estimation for survey estimators based on statistical learning models. *ICSA-Canada Chapter 2024 Symposium*, Niagara Falls, Canada, 7 - 9 June 2024.
- Dagdoug, M., Eustache, E. Haziza, D. (2024). Variance estimation for survey estimators based on statistical learning procedures. *SSC Annual Meeting*, St. John's, Canada, 2 - 5 June 2024.
- Dagdoug, M. (2024). Variance estimation for survey estimators based on statistical learning procedures. *Séminaire en ligne sur les sondages*, France (online), 18 April 2024.
- Dagdoug, M., Haziza, D. (2023). Variance estimation for survey estimators based on statistical learning procedures. *16th International Conference of the ERCIM WG on Computational and Methodological Statistics*, Berlin, Germany, 16-18 December 2023.
- Dagdoug, M., Goga, C. Haziza, D. (2023). Model-assisted estimation through random forests in finite population sampling. *12e Colloque International Francophone sur les Sondages*, Aubervilliers, France, 21-24 mars 2023.
- Dagdoug, M., Goga, C. Haziza, D. (2022). Analysis of regression tree and random forest imputation in surveys. *Summer School on Modern Methods in Survey Sampling*, Ottawa, Canada, 5 - 8 July 2022.
- Dagdoug, M., Goga, C. Haziza, D. (2022). Model-assisted estimation through random forests in finite population sampling. *Congrès annuel 2022 de la Société de Statistique du Canada*, Ottawa, Canada (online), 30 - 3 June 2022.
- Dagdoug, M., Goga, C. Haziza, D. (2022). High-dimensional convergence for model-assisted estimators. *ITACOSM2022*, Perugia, Italy, 8-10 June 2022.

- Dagdoug, M., Goga, C. Haziza, D. (2021). Random forests imputation in surveys. *Joint Statistical Meeting (JSM) 2021*, Seattle, United States (online), 7-12 August 2021.
- Dagdoug, M., Goga, C. Haziza, D. (2021). Model-assisted estimation through random forests in finite population sampling. *Statistics 2021 Canada*, Montreal, Canada (online), 15 - 18 July 2021.
- Dagdoug, M., Goga, C. Haziza, D. (2020). Model-assisted estimation through random forests in finite population sampling. *13th International Conference of the ERCIM WG on Computational and Methodological Statistics*, London, England (online), 19-21 December 2020.

## Contributed Conferences

- Dagdoug, M., Eustache, E. Haziza, D. (2023). High-dimensional model-assisted estimation for survey data. *SSC 2023 Annual Meeting*, Ottawa, Canada, 28-31 May 2023.
- Dagdoug, M., Goga, C. Haziza, D. (2022). Random forests in surveys: from model-assisted estimation to imputation. *Journées de Méthodologie Statistique de l'Insee 2022 (JMS2022)*, Paris, France, 29-31 March 2022.
- Dagdoug, M., Goga, C. Haziza, D. (2021). Random forests imputation in surveys. *Forum des Jeunes Mathématicien.ne.s*, Besançon, France, 8-10 December 2021.
- Dagdoug, M., Goga, C. Haziza, D. (2021). Model-assisted estimation through random forests in finite population sampling, presentation with Camelia Goga. *11e Colloque International Francophone sur les Sondages*, Bruxelles, Belgium, 6-8 October 2021.
- Dagdoug, M., Goga, C. Haziza, D. (2021). Random forests imputation in surveys. *11e Colloque International Francophone sur les Sondages*, Bruxelles, Belgium, 6-8 October 2021.
- Dagdoug, M., Goga, C. Haziza, D. (2021). Convergence rates of model-assisted estimators in high-dimensional settings. *63rd ISI World Statistics Congress*, The Hague, Netherlands (online), 11-16 July 2021.
- Dagdoug, M., Goga, C. Haziza, D. (2021). Model-assisted estimation through random forests in finite population sampling. *Conference in honor of Fred Smith and Chris Skinner*, Southampton, England (online), 7-9 July 2021.
- Dagdoug, M., Goga, C. Haziza, D. (2021). High-dimensional asymptotics for model-assisted estimation. *6ème Journée "Probabilités et statistiques Besançon-Dijon"*, Dijon, France, 5 July 2021.
- Dagdoug, M., Goga, C. Haziza, D. (2021). Model-assisted estimation through random forests in finite population sampling. *Congrès annuel 2021 de la Société de Statistique du Canada*, Ottawa, Canada (online), 7-11 June 2021.
- Dagdoug, M., Goga, C. Haziza, D. (2021). Model-assisted estimation through random forests in finite population sampling. *52ème Journées de Statistiques de la Société Française de Statistique*, Nice, France (online), 7-11 June 2021.
- Dagdoug, M. (2019). Imputation and calibration reweighting for surveys with missing data. *Sixième Journée des Jeunes Chercheurs en Mathématiques de l'UBFC*, Besançon, France, 12 April 2019.

## Invited Seminars

- Dagdoug, M. Statistical learning for finite population sampling: some challenges. *Séminaire de Probabilités et Statistique*, Université de Franche-Comté, 27 November 2023.
- Dagdoug, M., Goga, C. Haziza, D. (2023). Statistical inference in surveys with random forest imputed estimators. *Séminaire de Statistique*, Université Sherbrooke, 27 November 2023.

- Dagdoug, M., Goga, C. Haziza, D. (2023). Statistical inference in surveys with random forest imputed estimators. *Centre de Recherches en Mathématiques (CRM), Applied Mathematics Seminars*, Montreal, Canada, 18 September 2023.
- Dagdoug, M., Goga, C. Haziza, D. (2023). Statistical Inference in the Presence of Imputed Survey Data Through Regression Trees and Random Forests. *Bank of Canada*, Ottawa, Canada, 6 June 2023.
- Dagdoug, M., Goga, C. Haziza, D. (2022). Imputation par arbres de régression et forêts aléatoires en théorie des sondages. *Séminaire de l'Institut de Statistique de Neuchâtel*, Neuchâtel, Switzerland, 28 April 2022.
- Dagdoug, M., Goga, C. Haziza, D. (2022). Analysis of regression tree and random forest imputation in surveys. *Séminaire des doctorants du Laboratoire de Mathématiques de Besançon*, Besançon, France, 3 March 2022.
- Dagdoug, M., Goga, C. Haziza, D. (2022). Analysis of regression tree and random forest imputation in surveys. *Séminaire des doctorants de l'institut mathématiques de Bourgogne*, Dijon, France, 24 February 2022.
- Dagdoug, M., Goga, C. Haziza, D. (2020). Model-assisted estimation through random forests in finite population sampling. *Séminaire de l'équipe Probabilités et Statistiques du Laboratoire de Mathématiques de Besançon*, Besançon, France (distanciel), 30 November 2020.
- Dagdoug, M., Goga, C. Haziza, D. (2019). Model-assisted estimation through random forests in finite population sampling. *Séminaire des doctorants du Laboratoire de Mathématiques de Besançon*, Besançon, France, December 2019.

## RESEARCH VISITS

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- University of Neuchâtel, Neuchâtel, Switzerland, May 2022, 2 weeks on the invitation of Professor Yves Tillé.

## ADMINISTRATIVE RESPONSIBILITIES

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- July 2024 - June 2027: Committee Member, Student Travel Grants Committee, Statistical Society of Canada.
- March 2024: Committee Member, NSERC USRA and SURA Summer Research Awards - Ranking Committee, McGill University.
- August 2023 - Present: Committee Member, Committee of Undergraduate Affairs, McGill University.
- September 2023 - December 2023: Committee Member, Statistics Search Committee, McGill University.
- May 2020 - October 2022: Elected Member of the Carnot Pasteur Doctorate School, representing Ph.D. students in mathematics.
- February 2021 - October 2022: Elected Member of the BFC-Maths Federation, representing Ph.D. students of the Laboratory of Mathematics of Besançon.

## SCIENTIFIC ANIMATIONS

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- August 2023 - Present: Organizer of the McGill Statistics Seminar.
- Co-organizer with Valentin Petit (LmB) of the Septième Journée des Jeunes Chercheuses et des Jeunes Chercheurs en Mathématiques de l'UBFC (50 participants); website: <https://lmb.univ-fcomte.fr/Septieme-Journee-des-Jeunes-2332>.

- Member of the organizing committee and webmaster of the Forum des Jeunes Mathématicien.ne.s 2021 (3 jours, 70 participants); website: <https://jmb2021.sciencesconf.org>.
- Co-organizer with Valentin Petit (LmB) of the Ph.D. seminar for the academic year 2021-2022 (14 seminars).
- Co-organizer with Valentin Petit (LmB) of the Ph.D. seminar for the academic year 2020-2021 (15 seminars).

## INTERACTIONS WITH THE INDUSTRY

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- Collaboration with the Bank Of Canada through a Mitacs project. This includes the co-supervision (with David Haziza) of two PhD students collaborating with the Bank Of Canada as part of their Ph.D.
- Collaboration with the French company Médiamétrie during my Ph.D. and for the application of the methodology suggested in "Model-assisted estimation through random forests in finite population sampling" on real data collected by Médiamétrie.
- Participation at the *Semaine d'Etude Maths-Entreprises* (SEME) at Besançon, in 2019. Work in collaboration of Fabio Coppini (Université de Florence) and Émile Parolin (INRIA Saclay) for the Centre Régional De Lutte Contre Le Cancer Georges-François Leclerc in Dijon. This work resulted in the creation of a Python module and a report entitled "First Steps in Image Registration".

## INTERACTIONS WITH HIGH-SCHOOL STUDENTS AND VULGARIZATION

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- Presentation for "Soup and Science" entitled "Missing data treatment in surveys", February 28, 2024, Montreal.
- "Treatment of missing data in surveys", short talk to introduce research to undergraduates, Undergraduate Research Panel, January 22, 2024, Montreal.
- Popularization workshop entitled "Titanic, entre expédition maritime et promenade en forêts aléatoires", for the "Journée de la recherche en mathématiques", November 17, 2021, Besançon.
- "Les sondages: comment ça marche?", conference for the "Finale du rallye mathématiques des collégiens", June 2, 2022, Dijon.
- "Titanic, entre expédition maritime et promenade en forêts aléatoires", conference for the "Finale du rallye mathématiques des lycéens", June 2, 2022, Dijon.