

HELMER HERMAN KOPPELMAN

CONTACT

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ABOUT ME

I am passionate about a broad range of topics from science, finance, and economics to arts, politics, and literature. I am a world-leading astrophysicist, deriving my success in the field of Milky Way science from combining **theory** with **simulations** and **big data** (data sets with over a billion stars). Lastly, I have an affinity for **statistics**, **data science**, and **machine learning**.

LANGUAGES

Spoken

Dutch (native): ●●●●●

English: ●●●●●

Programming

Python/UNIX: ●●●●●

Fortran: ●●○○○

C/C++/SQL/HTML/Matlab: ●○○○○

LIBRARIES & TOOLS

Data preprocessing and analysis ●●●●●

(pandas, vaex, jupyter)

Scientific computing ●●●●●

(numpy, scipy, matplotlib)

Dimensionality reduction ●●●●○

(t-SNE, UMAP, PCA)

Classification algorithms ●●●●○

(xgboost, dbscan, sklearn)

Basic experience with NN ●○○○○

(keras, pytorch, normalizing flows)

MCMC simulations ●●●●○

Bayesian analysis ●●●○○

Modifying & optimizing code ●●●●○

PUBLICATIONS

	Total	First Author
Submitted	16	9
Refereed	14	8
Citations	802	191

See also [Google Scholar](#)

EDUCATION

PhD Astronomy 2016 - 2020

University of Groningen **cum laude**

MSc Astronomy 2014 - 2016

University of Groningen **cum laude**

BSc Astronomy 2011 - 2014

University of Groningen

SKILLS & COMPETENCES

1. Advanced statistics and quantitative data analysis

Some highlights (based on papers in the appendix) [papers]

• Cross-matching stars in multiple data sets [3,4,5,6]

• Bayesian maximum a posteriori regression analysis [7]

• Optimization of integral routines (>1000 times faster) [7]

• Modifying algorithms in C/C++ and Fortran [1,3,9,12]

• Developing an advanced mathematical framework [9,12]

• Time-series analysis of orbital frequencies [8]

2. Expert scientific programmer

• 5+ years experience in programming in Python with scientific applications (both scripting and notebooks).

• Creator of comprehensible publication-quality visualizations (featured in scientific papers, newspapers and magazines, documentaries, planetarium shows, and a textbook on galaxy formation).

• Responsible for pre-processing multi-purpose data sets for colleagues and collaborators.

3. Excellence in research

• First author of 9 papers that inspired several (ongoing) follow-up projects.

• Co-author of a seminal paper on the Milky Way's history.

• Offered a membership at the IAS in Princeton.

4. Leader & team player

• Secretary and chair (1yr each) of executive board sports club 2011 - 2013

• Founding executive board member (1.5 yr) study association 2016 - 2017

PROFESSIONAL EXPERIENCE

Postdoctoral Researcher

2020 -

Institute for Advanced Study

Through statistical analysis of large astronomical data sets and interpretation of observations with theory, I study the dynamics and formation history of the Milky Way.

EXTRACURRICULAR ACTIVITIES

Coaching & Teaching

Creating practice exams (2013-2016)

Supervision of students (2019-)

Teaching assistant:

'Intro to Programming' (2017, 2019)

'Dynamics of Galaxies' (2018, 2020)

Communication

20+ scientific talks

10+ public talks

3+ live interviews on local radio

5+ magazine interviews

Creating illustrations and animations for (inter)national media

Leadership & teamwork

Organizational work for the faculty, study association, and sports club:

Sports tournaments

Galas and other social events

Symposium

Faculty introduction camp

Program committee of astronomy

Chair of first-year PhD committee

Machine Learning

Top 5% in a [kaggle.com](#) competition for machine learning where I trained our best performing neural network

Resume Addendum

Selected Talks:

Talks at IAS, Princeton University, Flatiron Institute/CCA	2020-2021
Various talks at institutes in The Netherlands	2016-2020
KITP Santa Barbara: 3-week stay, 'Dynamical Models for Stars and Gas in Galaxies in the Gaia Era'	April-2019
Harvard: lunch talk, 2-day visit	April-2019
Yale: lunch talk, 1-day visit	April-2019
CCA: lunch talk, 2-day visit	April-2019
Shanghai: contributed talk at the 'The life and times of the Milky Way' conference	Nov-2018
Heidelberg: contributed talk at the 'Survival of Dense Star Clusters in the MW' conference	Nov-2018

First authored and relevant co-authored publications

[1]	Koppelman et al. 2018a	arXiv	DOI: arXiv:1804.07530
[2]	Koppelman et al. 2018b	APJ-L	DOI: 10.3847/2041-8213/aac882
[3]	Koppelman et al. 2019a	A&A	DOI: 10.1051/0004-6361/201834769
[4]	Koppelman et al. 2019b	A&A	DOI: 10.1051/0004-6361/201936738
[5]	Koppelman et al. 2020a	A&A	DOI: 10.1051/0004-6361/202038652
[6]	Koppelman & Helmi 2020b	A&A	DOI: 10.1051/0004-6361/202038178
[7]	Koppelman & Helmi 2021a	A&A	DOI: 10.1051/0004-6361/202038777
[8]	Koppelman , Hagen, Helmi 2021b	A&A	DOI: 10.1051/0004-6361/202039390
[9]	Koppelman & Helmi 2021c	A&A	DOI: 10.1051/0004-6361/202039968
[10]	Helmi, Babusiaux, Koppelman , et al. 2018	Nature	DOI: 10.1038/s41586-018-0625-x
	<i>Contribution: I analyzed the simulation and took care of the dynamical analysis (Fig. 1 & 3)</i>		
[11]	Massari, Koppelman , and Helmi 2019	A&A	DOI: 10.1051/0004-6361/201936135
	<i>Contribution: I did the dynamical analysis in this work and assisted in grouping the globular clusters.</i>		
[12]	Helmi & Koppelman 2016	APJ-L	DOI: 10.3847/2041-8205/828/1/L10
	<i>Contribution: During my MSc thesis, I modeled dark matter - stream interactions, the results of my thesis led to a paper.</i>		

Relevant courses

Programming & statistical methods

Introduction to programming
Computational physics
Statistical Signal Processing
Statistical and numerical methods

Math:

Calculus
Linear algebra
Complex analysis
Vector analysis

Physics:

Mechanics and relativity
Advanced mechanics
General relativity
Astrophysical hydrodynamics
Dynamics of galaxies
Waves and optics
Quantum physics
Electricity & magnetism
Structure of matter

Stellar structure and evolution
Electrodynamics of radiation
processes
Particle physics phenomenology
Astroparticle physics
High-energy astrophysics
Cosmic structure formation
Star and planet formation
Formation and evolution of galaxies
Statistical Physics