Jeremy Welsh

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Github: github.com/jeremyiwk

Education

- **University of Oregon** — Eugene, OR
  Master of Science, Physics, GPA: 3.92 — Sep 2020 - Jun 2022
- **University of Oregon** — Eugene, OR
  Bachelor of Science, Mathematics and Physics, GPA: 3.83 — Sep 2016 - June 2020

Work Experience

- **Senior Intern** — Jun 2022 – Present
  Thermo Fisher Scientific — Hillsboro, OR
  - ◇ Wrote Python scripts to automate milling and imaging procedures on dual-beam scanning electron microscope systems.
  - ◇ Performed image registration on ion beam images using cross-correlation and a TensorFlow convolutional neural network to detect ∼100nm machining tolerances in ion column components.
  - ◇ Developed Python code to measure optical aberrations in ion beam images using computer vision tools from OpenCV and Skimage.
  - ◇ Wrote custom ion column elements in C for ion column simulations using GPT simulation software.
  - ◇ Contributed to scientific software (Python) for parallelizing GPT simulations and processing data in a Linux HPC environment.
  - ◇ Developed algorithms for regression of sparse simulation data to optimize novel ion column designs, resulting in up to 300% improvement in ion beam performance.
  - ◇ Used Python libraries such as NumPy, SciPy, Pandas, Matplotlib, and Seaborn for data analysis, visualization, and presentation to a team of scientists in order to direct critical decisions about experimental design.

- **Graduate Research Assistant** — Sep 2020 – Jun 2022
  University of Oregon — Eugene, OR
  - ◇ Developed theoretical models for organic macromolecules at multiple resolutions using mathematical tools from non-equilibrium statistical mechanics.
  - ◇ Validated theoretical models against experimental data using molecular dynamics and Monte Carlo simulation data.
  - ◇ Mentored undergraduate and graduate research assistants on projects related to molecular coarse-graining schemes and simulation data analysis
  - ◇ Performed and analyzed molecular dynamics simulations using GROMACS and LAMMPS molecular dynamics software on HPC clusters at San Diego Supercomputer Center.
  - ◇ Characterized performance and the degree of parallelism of molecular dynamics simulations to determine computational resources requirement on 128 Core/node HPC system.
  - ◇ Developed programs in Python and Fortran for data analysis of ∼10TB of molecular dynamics simulation data.
  - ◇ Developed Fortran code to create input data for polymers of arbitrary length for MCCCS Towhee Monte Carlo molecular simulation software
  - ◇ Developed novel coarse-grained models of DNA and validated models using custom Python and Fortran code, leading to improved agreement between predicted and simulated correlation statistics over prior models.
  - ◇ Performed DBSCAN clustering on molecular dynamics simulation data to define regions for Markov Chain Monte Carlo simulation.
  - ◇ Validated coarse-grained molecular models against predictions of statistical models such as principal component analysis (PCA) and time-lagged independent component analysis (t-ICA).
  - ◇ Developed coarse-grained molecular model using PCA and an Autoencoder neural network to perform non-linear dimensionality reduction on the model parameter space.

Technical Skills

- **Programming Languages**: Python, Fortran, C++, C, R, MATLAB, Julia, Shell scripting (Unix/macOS), Mathematica
- **Frameworks**: NumPy, Pandas, SciPy, Scikit-Learn, TensorFlow, OpenCV, PyMC, Matplotlib, Numba, ggplot2
- **Software & Tools**: Git, Docker, General Particle Tracer (GPT), GROMACS, LAMMPS

University of Oregon
Office of the Registrar 5257 University of Oregon Eugene, Oregon 97403-5257 Phone 541-346-2935

Graduate Transcript

Record of: **Welsh-Kavan, Jeremy Ian** Print Date: 30-JUN-22 ID: **951-40-1986**

Date of Birth: 01/31/XX
High School: Grant High School, Jun 01, 2014
Admit Term: Fall 2020
Matric Term: Fall 2016
UO Degrees: Bachelor of Science, Jun 15, 2020
Cum Laude
Majors: Mathematics
Physics, with Departmental Honors
Master of Science, Jun 13, 2022
Major: Physics

Subject No		*Course Title*	*Credits*	*Grade*	*Repeat*
Fall 2020		**Physics**	**Doctoral**		
CH	547	Computational Chem	4.00	A +	
PHYS	610	Math Mthds Elec & Magn	4.00	A	
PHYS	611	Theoretical Mechanics	4.00	B +	
PHYS	631	Quantum Mechanics	4.00	A +	
COVID-19 disruption: remote instruction for most courses; expanded pass/no pass grades.					
Earned Hrs: 16.00 GPA Hrs: 16.00 Quality Pts: 63.60 GPA: 3.97					
Winter 2021		**Physics**	**Doctoral**		
PHYS	607	Sem Early Research	1.00	P*	
PHYS	612	Theoretical Mechanics	2.00	A	
PHYS	613	Statistical Physics	2.00	A	
PHYS	622	Electromagnetic Theory	4.00	B	
PHYS	632	Quantum Mechanics	4.00	B +	
Earned Hrs: 13.00 GPA Hrs: 12.00 Quality Pts: 41.20 GPA: 3.43					
Spring 2021		**Physics**	**Doctoral**		
PHYS	607	Sem Physics Colloq	1.00	P*	
PHYS	607	Sem Early Research	1.00	P*	
PHYS	614	Statistical Physics	4.00	A-	
PHYS	623	Electromagnetic Theory	4.00	A	
PHYS	633	Quantum Mechanics	4.00	A +	
Earned Hrs: 14.00 GPA Hrs: 12.00 Quality Pts: 48.00 GPA: 4.00					
Fall 2021		**Physics**	**Doctoral**		
BI	610	Adv Biol Statistics	4.00	A	
MATH	510	Machine Learn Stats	4.00	A	
Earned Hrs: 8.00 GPA Hrs: 8.00 Quality Pts: 32.00 GPA: 4.00					
Winter 2022		**Physics**	**Doctoral**		
MATH	607	Sem Appl Math II Stats	1.00	W	
MATH	607	Sem Computer Algebra	5.00	A +	
COVID-19 disruption: extended grade option change deadline.					
Earned Hrs: 5.00 GPA Hrs: 5.00 Quality Pts: 21.50 GPA: 4.30					
Spring 2022		**Physics**	**Doctoral**		
CIS	670	Data Science	4.00	A	
PHYS	510	Scientific Computation	4.00	A +	
PHYS	607	Sem Phys Colloquium	1.00	P*	
Earned Hrs: 9.00 GPA Hrs: 8.00 Quality Pts: 33.20 GPA: 4.15					

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Subject No	*Course Title*	*Credits*	*Grade*	*Repeat*

Transcript Totals

	Earned Hrs	*GPA Hrs*	*Points*	*GPA*
Total Institution:	65.00	61.00	239.50	3.92
Total Transfer:	0.00			
Overall:	65.00			

End of Transcript

Issued to: Jeremy Welsh-Kavan
jeremy@micromelody.net

Julia A Pomerenk
University Registrar

University of Oregon
Office of the Registrar 5257 University of Oregon Eugene, Oregon 97403-5257 Phone 541-346-2935

Undergraduate Transcript

Record of: **Welsh-Kavan, Jeremy Ian** Print Date: 30-JUN-22 ID: **951-40-1986**

Date of Birth: 01/31/XX
High School: Grant High School, Jun 01, 2014
Admit Term: Fall 2016
Matric Term: Fall 2016
UO Degrees: Bachelor of Science, Jun 15, 2020
Cum Laude
Majors: Mathematics
Physics, with Departmental Honors
Master of Science, Jun 13, 2022
Major: Physics

Transfer Work:
14F-16S Portland Community College 46.00 Credits

Subject No	*Course Title*	*Credits*	*Grade*	*Repeat*
Fall 2016	**Chemistry**		**Undergraduate**	
MATH 256	Intro Differ Equations		4.00	A-
MATH 307	Introduction to Proof		4.00	C
PHYS 251	Foundat Physics I		4.00	A-
PHYS 290	Foundations Phys Lab		1.00	C
Earned Hrs: 13.00 GPA Hrs: 13.00 Quality Pts: 39.60 GPA: 3.04				
Winter 2017	**Chemistry**		**Undergraduate**	
ARH 354	Art Since 1945		4.00	A-
MATH 281	Several-Variab Calc I		4.00	A-
MATH 341	Elem Linear Algebra		4.00	A+
PHYS 252	Foundat Physics I		4.00	B
Earned Hrs: 16.00 GPA Hrs: 16.00 Quality Pts: 58.80 GPA: 3.67				
Spring 2017	**Mathematics**		**Undergraduate**	
MATH 282	Several-Variab Calc II		4.00	A+
MATH 315	Elementary Analysis		4.00	A+
MATH 342	Elem Linear Algebra		4.00	A+
PHYS 253	Foundat Physics I		4.00	A
Earned Hrs: 16.00 GPA Hrs: 16.00 Quality Pts: 67.60 GPA: 4.22				
Dean's List				
Fall 2017	**Mathematics**		**Undergraduate**	
MATH 413	Intro Analysis I		4.00	P
MATH 421M	Fourier Analysis I		4.00	A
REL 321	Hist of Christianity		4.00	A
Earned Hrs: 12.00 GPA Hrs: 8.00 Quality Pts: 32.00 GPA: 4.00				
Winter 2018	**Mathematics**		**Undergraduate**	
ANTH 119	Anthropology & Aliens		4.00	W
MATH 411	Func Complex Var I		4.00	A
MATH 422	Fourier Analysis II		4.00	A
PSY 202	Mind and Society		4.00	B+
Earned Hrs: 12.00 GPA Hrs: 12.00 Quality Pts: 45.20 GPA: 3.76				
Spring 2018	**Mathematics**		**Undergraduate**	
ARH 210	Cntmp Asian Art & Arch		4.00	A+
EC 201	Intro Econ Analy Micro		4.00	B+
MATH 433	Intro Differen Geom		4.00	A-
Earned Hrs: 12.00 GPA Hrs: 12.00 Quality Pts: 45.20 GPA: 3.76				

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Subject No	*Course Title*	*Credits*	*Grade*	*Repeat*
Fall 2018	**Mathematics**		**Undergraduate**	
MATH 444	Intro Abstract Alg I		4.00	B
MATH 461	Intro Methods Stats I		4.00	A
PHYS 401	Research		1.00	P*
PHYS 412	Mechan/Electric/Magnet		4.00	A
Earned Hrs: 13.00 GPA Hrs: 12.00 Quality Pts: 44.00 GPA: 3.66				
Winter 2019	**Mathematics**		**Undergraduate**	
PHYS 401	Research		1.00	P*
PHYS 411	Mechan/Electric/Magnet		4.00	A
PHYS 413	Mechan/Electric/Magnet		4.00	A+
REL 353	Dark Self East/West	>1	4.00	B
Earned Hrs: 13.00 GPA Hrs: 12.00 Quality Pts: 45.20 GPA: 3.76				
Spring 2019	**Mathematics**		**Undergraduate**	
EC 327	Intro to Game Theory	>2	4.00	A
PHYS 391	Experim Data Analy Lab		4.00	A
PHYS 410	Modern Optics Lab		4.00	A-
PHYS 432	Digital Electronics		4.00	A
Earned Hrs: 16.00 GPA Hrs: 16.00 Quality Pts: 62.80 GPA: 3.92				
Dean's List				
Fall 2019	**Mathematics**		**Undergraduate**	
PHIL 102	Ethics	>1	4.00	A-
PHYS 351	Foundat Physics II		4.00	A+
PHYS 414	Quantum Physics		4.00	A
Earned Hrs: 12.00 GPA Hrs: 12.00 Quality Pts: 48.00 GPA: 4.00				
Winter 2020	**Mathematics**		**Undergraduate**	
MATH 351	Elem Numeric Analy I		4.00	A
PHYS 352	Foundat Physics II		4.00	A-
PHYS 415	Quantum Physics		4.00	A+
Earned Hrs: 12.00 GPA Hrs: 12.00 Quality Pts: 48.00 GPA: 4.00				
Spring 2020	**Mathematics**		**Undergraduate**	
PHYS 353	Foundat Physics II		4.00	A+
PHYS 417	Topics Quantum Physics		4.00	A+
WR 123	College Composit III		4.00	A
COVID-19 disruption: remote instruction for courses; expanded pass/no pass grades.				
Earned Hrs: 12.00 GPA Hrs: 12.00 Quality Pts: 50.40 GPA: 4.20				
Fall 2021	**Physics**		**Doctoral**	
PEO 251	Rock Climbing I		1.00	P*
Earned Hrs: 1.00 GPA Hrs: .00 Quality Pts: .00 GPA: .00				
Winter 2022	**Physics**		**Doctoral**	
PEAS 368	Scuba: Basic		2.00	P*
COVID-19 disruption: extended grade option change deadline.				
Earned Hrs: 2.00 GPA Hrs: .00 Quality Pts: .00 GPA: .00				

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Undergraduate Transcript

Record of: **Welsh-Kavan, Jeremy Ian** Print Date: 30-JUN-22 ID: **951-40-1986**

Subject No	*Course Title*	*Credits*	*Grade*	*Repeat*

Transcript Totals

	Earned Hrs	*GPA Hrs*	*Points*	*GPA*
Total Institution:	162.00	153.00	586.80	3.83
Total Transfer:	46.00			
Overall:	208.00			

End of Transcript

Issued to: **Jeremy Welsh-Kavan**
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Julia A Pomerenk
University Registrar

Accreditation

The University of Oregon is accredited by the Northwest Commission on Colleges and Universities.

Authenticity

An official University of Oregon transcript is printed on white security paper with a green background and a dark green border. The University seal appears in the center. Facsimiles of the University Registrar's signature and the University seal are printed at the bottom or on the reverse. If the transcript is photocopied, the word "void" will appear across the face. Attempts to alter the transcript using chemical agents will cause the paper to stain brown. A thermochromic ink square appears at the bottom of the page.

Academic records for students attending Fall 1986 and after are printed in portrait format (8½" x 11" vertical). Records prior to Fall 1986 are printed in landscape format (8½" x 11" horizontal). Some records of coursework taken prior to Fall 1986 may have been converted to the portrait format.

Separate transcripts are generated for each level: undergraduate, graduate, law. Students may request a partial transcript to include only a specific level.

In accordance with the recommendations of the American Association of Collegiate Registrars and Admissions Officers, all transcripts provided directly to the student, whether official or unofficial, will be marked "Issued to Student," or have other markings to clearly inform the receiver that the transcript has been personally handled by the student.

Degrees and Credit Awarded by other Institutions

Any information displayed reflecting degrees awarded by, or transfer work accepted from, other institutions should be verified with the original institution for accuracy.

Course Numbering System

001-099	Remedial courses which carry no credit toward a degree. Exceptions: MATH 095 and first-year foreign languages taken prior to Summer 1982.
100-299	Lower-division undergraduate credit. H designates Honors College courses.
300-399	Upper-division undergraduate credit. H designates Honors College courses.
400-499	Upper-division undergraduate credit H designates Honors College courses. Prior to Fall 1990, courses designated G or M carry graduate credit.
500-599	Graduate credit intended for graduate students; undergraduates may be enrolled in the same course when a corresponding 400-level section is being offered. Prior to Fall 1990, with designation P, professional courses suitable for graduate students holding a bachelor's degree in a field other than their graduate professional field.
600-699	Graduate credit: enrollment limited to graduate students only.
700-799	Graduate credit for graduate professional degrees only.

Courses numbered 198, 199, 399. 400-410, 500-510, 600-610 and 700-710 may be repeated in successive terms under the same number, with varying credits.
M designates multi-listed courses.

Student Classification

Student major and type appear with each term designation for students attending after Summer 1990.

Undergraduate (UG)	Graduate (GR)	Law (LW)	Non-Admit (NU, NG)
Freshman (0-44 credits)	Post Bacca!aureate	Unclassified	Unclassified
Sophomore (45-89 credits)	Pre-Masters	First Year	Community Education
Junior (90-134 credits)	Conditional-Masters	Second Year	Pre-Baccalaureate
Senior (135+ credits)	Masters	Third Year	
Post Bacca!aureate	Post-Masters	Master of Laws	
	Conditional Doctoral		
	Doctoral		
	Post-Doctoral		

Grading System

Grade	*Points*	*Definition*
A	4	Excellent
B	3	Good
C	2	Satisfactory
D	1	Inferior performance. Not used Fall 1970-Summer 1977. Law School use effective Fall 1978.
F	0	Unsatisfactory performance, no credit awarded. Not used Fall 1970-Summer 1977.
+ or -	-	Plus or minus 0.30 points, effective Fall 1990; Law School: plus 0.50 points, Fall 1990-Summer 1993.
P	-	Satisfactory: undergraduate work, C- or above; graduate work, B- or above; law work, D- or above.
N	-	Less than satisfactory performance, no credit awarded: undergraduate work, D+ or lower; graduate work, C+ or lower. Law work calculated as F (0 points) in the GPA.
AU	-	Audit, no credit awarded. Effective Fall 1990.
W	-	Officially withdrawn without penalty.
I	-	Incomplete; when the quality of work is satisfactory, but some minor yet essential requirement must be completed.
X	-	No grade reported by the instructor. Recorded by the Registrar.
Y	-	No basis for grade. Recorded by the instructor. Used through Summer 2017.

Credit

Undergraduate and graduate credits are recorded in quarter hours. Effective Fall 1973, Credit on Law-level records is recorded in semester hours. Credit earned at another institution and accepted by the University of Oregon is recorded in quarter hours.

Symbols used on the Transcript

Immediately following the grade:

*	Course offered P/N only. Restriction set by Curriculum Committee or academic department.
#	Following grade of N, course taken P/N. Used Fall 1970-Summer 1977.
D or E	Repetition, or remedial course carrying no credit. Excluded from term and cumulative GPA. +
G	Repeated course, excluded from cumulative GPA only. Effective Fall 2016. +
L	Repeated course, included in term and cumulative GPA. Effective Fall 2016. +
M	Regression, included in term and cumulative GPA. Effective through Summer 2016, also used to indicate repetition. +
R	Reserved for graduate credit. Effective through Summer 1990.

+ Credit is awarded only once for non-repeatable courses, and is not awarded for regression or coursework taken beyond catalog limitations. GPA exclusions apply only to graded (A-F) courses.

Immediately following the course title:

>1	Approved for Arts & Letters group. (Undergraduate degree requirement effective Fall 1982.)
>2	Approved for Social Science group. (Undergraduate degree requirement effective Fall 1982.)
>3	Approved for Science group. (Undergraduate degree requirement effective Fall 1982.)
>4	Approved for Science group and Math requirement. (Undergraduate degree requirement effective Fall 1983.)
>5	Approved for Math requirement. (Undergraduate degree requirement effective Fall 1983.)

Totals

Definitions: Ehrs, Earned hours; GPA-hrs, credits used in GPA calculation; Pts, quality points.
Academic Standing is indicated either in the comments section or as a notation following the term totals line.

Grade Point Average

The University of Oregon reinstated the GPA Fall 1990. No GPA is calculated for students last enrolled prior to Fall 1990.
The GPA is determined by dividing the total points by total GPA hours. Only UO work is used in calculating the GPA.