

# Tao F. Gaede

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## Objective:

Pursue graduate studies in mathematics to develop and expand my research interests as well as acquire a broad foundation in discrete mathematics, algebra, and analysis. I intend to draw upon this experience in future work as a research mathematician in academia, government, or industry.

## Education:

Institution	Time	Studies
Okanagan College (OC)	2013 - 2015	General art and science courses with a concentration in biology
University of British Columbia (UBCO)	2015 - 2018	Bachelor of science degree with a major in mathematics and biology minor

## Selected Coursework:

Name	Grade	Class Average	Subject	Institution
MATH 448 - Directed Studies (6)	91%	-	Research project discussed below	UBCO
MATH 323 - Applied Abstract Algebra (3)	89%	46%	- Design theory: BIBDs, difference sets, and Hadamard matrices - Coding theory: Linear and BCH codes	UBCO
CSC 111 - Introduction to Computer Programming (3)	100%	75%	Procedural programming in java	UBCO

## Research:

	Combinatorial Research Project (under supervision of Dr. Wayne Broughton at UBCO)	Mathematical Music Theory Book for Composers (independent)
Time	Mar 2018 - Aug 2018	Sep 2018 - Dec 2019
Objective	Study evenness on rotationally invariant integer compositions and related mathematical music theory objects called Euclidean rhythms.	Using integer compositions as mathematical representatives of scales, write a book that includes an enumeration of all musical scales in Western harmony in a way directly useful and meaningful to musicians
Method	- Read the academic literature on Euclidean rhythms and evenness - Coded several programs to assist research using the Maple computer algebra system	- Studied application of evenness measures to order the scales - Formated lists in Excel - Music notation done in Sibelius - Used Maple to assist with analysis, enumeration, and sorting of scales - Researched mathematical music theory literature
Results	- Derived counting formula for rotationally invariant compositions of $k$ with length $n$ using Polya theory - Found unproven proposition in Euclidean rhythm literature and proposed a proof.	- Created an evenness partial ordering on rotationally invariant integer compositions that I used to define harmonic consonance
Deliverable	Wrote research paper that included a literature review, mathematical constructions with proofs, and a discussion on the application of rotationally invariant compositions and evenness to both harmony and rhythm in music theory	Wrote book satisfying objective using a novel perspective based on the synthesis of harmonic dualism and the emphasis of fifth interval evenness as a proxy for consonance

### Presenting/Speaking:

Time	Endeavor	Description
Mar 2018	Gave 1.5hr lecture in MATH 410 - Topology	Introduced homotopy relation and fundamental group with positive feedback from both students and professor
Aug 2018 - Ongoing	Interlocutor on the Infinite Monkeys Podcast	Longform 3-way discussions on creativity and science

### Conferences:

Conference	Location	Time	Description
Fields Summer School on Topological Data Analysis (TDA) for Banking and Finance	Western University, London Ontario	Jul 16 <sup>th</sup> - Jul 27 <sup>th</sup> 2018	Introduced financial mathematics, TDA methods, and their implementation using python

### Writing:

Time	Endeavor	Description
Jun 2011 - Apr 2013	Member of a writers group in Vernon, BC (attended weekly)	- Gave constructive criticism to other members' works - Regularly received criticism of my work and edited accordingly
Sep 2013 - Apr 2014	Creative writing student at OC	- Wrote new prose weekly - Read and wrote critiques of fellow students' works weekly
Jan 2017 - May 2017	Music Reviewer for Chamber Music Kelowna	Wrote monthly concert reviews for Chamber Music Kelowna classical concerts, which were published in the Daily Courier (Kelowna, BC).
Sep 2018 - Ongoing	Amateur Writing	- Regularly write poetry and essays on general topics - Write short stories in science fiction universe I built

### Music Composition:

Client(s)	Time	Description
Opera Kelowna	Jan 2015 - Jun 2015	Composed short opera
KCMS and Kelowna chamber music musicians	2012 - 2016	Composed by commission several chamber music works (all performed locally)
Bandcamp Extended Plays	Sep 2018 - Ongoing	See <a href="http://www.taogaede.bandcamp.com">www.taogaede.bandcamp.com</a>
Instagram Music	May 2019 - Ongoing	Regularly upload piano improvisation videos