Jordan Bennett Louis Smith

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I study musical structure and other topics in music informatics. I regularly contribute to ISMIR, the leading international venue for music informatics, and to conferences and journals in fields including music theory, music perception, signal processing, and the mathematics of music.

Current position

2014–2017 Post-doctoral research scientist, National Institute of Advanced Industrial Science and Technology (AIST), Media Interaction Group.
Supervisor: Masataka Goto <m.goto@aist.go.jp>

Role: to develop technology that can increase users' engagement with and appreciation of music.
Recent projects include:

- a system that describes multiple layers of a song's structure independently, accomplished using a combination of source separation and structural analysis techniques;
- a music video analysis system to discover and classify derivative works (e.g., covers, live renditions, dance performances, karaoke versions, etc.);
- the CrossSong puzzle, a logic puzzle game based on musical mashups.

Education

2012–2014 Ph.D. in Electrical Engineering and Computer Science, Queen Mary University of London.
2010–2012 M.Sc. in Operations Research Engineering, University of Southern California.
2008–2010 M.A. in Music Technology, McGill University.
2007–2008 Special student in Music Theory, McGill University.
2002–2006 B.A. in Music and Physics (joint major), Harvard College.

Previous Work Experience

Jan.–Aug. 2010 Researcher for the Structural Analysis of Large Amounts of Music Information (SALAMI) project.

- planned and implemented the creation of a large new dataset of music structure annotations;
- developed and tested a novel annotation format;
- evaluated, trained and hired annotators;
- oversaw months of data collection;
- presented a description of the dataset at ISMIR conference (Smith et al. 2011);
- to the present, I continue to manage and update the dataset.

Website: https://ddmal.music.mcgill.ca/salami
Data: https://github.com/DDMAL/salami-data-public

Sept. '08–Jun. '09 Teaching assistant at McGill University, MUTH 110 (Melody and Counterpoint) with Prof. Jonathan Wild, MUTH 111 (Harmony and Analysis) with Prof. Carmen Sabourin.

- taught two weekly sections;
- met individually with students during office hours;
- graded homework and exams;
- delivered a guest lecture on invertible counterpoint for Prof. Wild.

Languages & Tools

Coding: Python, Matlab. (Used as needed: R, Ruby, Javascript.)
Tools: Git, LaTeX/BibTeX, NumPy/SciPy, Pandas, HTML/CSS.
Music: Max/MSP, Pure Data, Sonic Visualiser, FL Studio, Audacity, Pro Tools.
Spoken: English (fluent), French (fluent), Japanese (basic).

Fellowship funding

June 2014	$40,000 (CAD) over two years. Fonds québécois de la recherche sur la société et la culture (FQRSC). Provincial grant to support Ph.D. research. (Awarded in 2012; deferred to avoid concurrence with SSHRC. Funds only drawn on for two semesters due to early graduation.)
May 2012	$40,000 (CAD) over two years. Social Sciences and Humanities Research Council (SSHRC). Federal grant to support Ph.D. research.
Aug. 2010	$120,000 (USD) plus tuition over 4 years. USC Provost's Ph.D. Fellowship. Recognises potential to lead in my discipline. (Only drawn on for 2 years due to departure for Queen Mary.)
May 2010	$15,000 (CAD). Fonds québécois de la recherche sur la société et la culture (FQRSC). Provincial grant to support Master's research. (Awarded in 2009; deferred to avoid concurrence with SSHRC. Only drawn on for two semesters.)
May 2009	$17,500 (CAD). Social Sciences and Humanities Research Council (SSHRC). Federal grant to support Master's research.

Publications

Book

J. B. L. Smith, E. Chew and G. Assayag, eds. 2016. *Mathemusical Conversations: Mathematics and Computation in Music Performance and Composition*. Volume 32 of Lecture Notes Series, Institute for Mathematical Sciences, National University of Singapore. World Scientific / Imperial College Press.

Journal articles

J. B. L. Smith, J. Kato, S. Fukayama, G. Percival, and M. Goto. 2017. The CrossSong Puzzle: Developing a logic puzzle for musical thinking. *Journal of New Music Research.* [Available online; to appear in print later this year.]

J. B. L. Smith, C.-H. Chuan and E. Chew. 2014. Audio properties of perceived boundaries in music. *IEEE Transactions on Multimedia* 16:5. 1219–28.

J. B. L. Smith, I. Schankler and E. Chew. 2014. Listening as a creative act: Meaningful differences in structural annotations of improvised performances. *Music Theory Online* 20:3.

Conference articles (peer review of full text)

J. B. L. Smith and M. Goto. 2017. Multi-part pattern analysis: Combining structure analysis and source separation to discover intra-part repeated sequences. To appear in *Proceedings of the International Society for Music Information Retrieval Conference (ISMIR)*. Suzhou, China.

J. B. L. Smith and E. Chew. 2017. Automatic interpretation of music structure analyses: A validated technique for post-hoc estimation of the rationale for an annotation. To appear in *Proceedings of ISMIR*. Suzhou, China.

J. B. L. Smith, M. Hamasaki, and M. Goto. 2017. Classifying derivative works with search, text, audio and video features. In *Proceedings of the International Conference on Multimedia and Expo*. Hong Kong, China. 1428–33.

Yang, L., A. Maezawa, **J. B. L. Smith**, and E. Chew. 2017. Probabilistic transcription of sung melody using a pitch dynamic model. In *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing*. New Orleans, LA, USA. 301–5.

Watanabe, K., Y. Matsubayashi, N. Orita, N. Okazaki, K. Inui, S. Fukayama, T. Nakano, **J. B. L. Smith**, and M. Goto. 2016. Modeling discourse segments in lyrics using repeated patterns. In *Proceedings of the International Conference on Computational Linguistics*. Osaka, Japan. 1959–69.

J. B. L. Smith and M. Goto. 2016. Using priors to improve estimates of music structure. *Proceedings of ISMIR*. 554–60. New York City, USA.

J. B. L. Smith, G. Percival, J. Kato, M. Goto and S. Fukayama. 2015. CrossSong Puzzle: Generating and unscrambling music mashups with real-time interactivity. *Sound and Music Computing Conference*. 61–7. Maynooth, Ireland. [**Best Paper Award**]

J. B. L. Smith and E. Chew. 2013. A meta-analysis of the MIREX Structural Segmentation task. In *Proceedings of ISMIR*. Curitiba, Brazil. 251–6.

J. B. L. Smith and E. Chew. 2013. Using Quadratic Programming to estimate feature relevance in structural analyses of music. In *Proceedings of the ACM International Conference on Multimedia*. Barcelona, Spain. 113–22.

M. Terrell, J., G. Fazekas, A. J. R. Simpson, **J. B. L. Smith**, S. Dixon. 2012. Listening level changes music similarity. In *Proceedings of ISMIR*. Porto, Portugal. 487–92.

J. B. L. Smith, J. A. Burgoyne, I. Fujinaga, D. De Roure and J. S. Downie. 2011. Design and creation of a large-scale database of structural annotations. In *Proceedings of ISMIR*. Miami, Florida. 555–60.

M. Bay, J. A. Burgoyne, T. Crawford, D. De Roure, J. S. Downie, A. Ehmann, B. Fields, I. Fujinaga, K. Page and **J. B. L. Smith**. 2011. Towards web-scale computational musicology: An update on the SALAMI project. In *Proceedings of the 10th UK e-Science All Hands Meeting*. York, England.

I. Schankler, **J. B. L. Smith**, A. François and E. Chew. 2011. Emergent formal structures of factor oracle-driven musical improvisations. Mathematics and Computation in Music, eds. C. Agon, M. Andreatta, G. Assayag, E. Amiot, J. Bresson and J. Mandereau. *Lecture Notes in Artificial Intelligence* 6726, 241–54.

C. McKay, J. A. Burgoyne, J. Hockman, **J. B. L. Smith**, G. Vigliensoni and I. Fujinaga. 2010. Evaluating the genre classification performance of lyrical features relative to audio, symbolic and cultural features. In *Proceedings of ISMIR*. Utrecht, Netherlands. 213–8.

B. Li, **J. B. L. Smith** and I. Fujinaga. 2009. Optical audio reconstruction for stereo phonograph records using white light interferometry. In *Proceedings of ISMIR*. 627–32.

Oral presentations and posters (peer review based on abstract)

J. B. L. Smith and E. Chew. August 2016. "Validating a technique for post-hoc estimation of a listener's focus in music structure analysis." Oral presentation seminar on Cognitively based Music Informatics Research (CogMIR), New York City, USA.

J. B. L. Smith, M. T. Pearce and E. Chew. February 2015. "Validating an optimisation technique for estimating the focus of a listener." Poster presentation at Mathemusical Conversations workshop, Singapore.

Müller, M. and **J. B. L. Smith**. 27 October 2014. "Music Structure Analysis." Tutorial at the International Society for Music Information Retrieval Conference, Taipei, Taiwan.

J. B. L. Smith, M. T. Pearce and E. Chew. 19 September 2014. "The role of attention in the perception of music structure." Poster presented at the International Conference of Students of Systematic Musicology, London, UK.

J. B. L. Smith, C.-H. Chuan and E. Chew. 9 August 2013. "Learning about structural analysis from structural analyses." Talk at the biennial meeting of the Society for Music Perception and Cognition, Toronto, ON, Canada.

J. B. L. Smith, I. Schankler and E. Chew. 8 August 2013. "Why do listeners disagree about large-scale formal structure? A case study." Talk at the biennial meeting of the Society for Music Perception and Cognition, Toronto, ON, Canada.

J. B. L. Smith, C.-H. Chuan and E. Chew. 18 December 2012. "Boundaries and novelty: the correspondence between points of change and perceived boundaries." Presentation at the Digital Music Research Network One-day Workshop, London, UK.

T. Brochier, **J. B. L. Smith** and E. Chew. 28 October 2011. "Can an overly slow initial tempo counteract the deceleration caused by auditory delay?" Poster presented at ISMIR late-breaking and demo session, Miami, FL.

J. B. L. Smith and I. Fujinaga. 2010. "A comparison and evaluation of approaches to the automatic formal analysis of musical audio." Poster presented at the joint American Musicological Society / Society for Music Theory Annual Meeting, Indianapolis, IN.

Invited talks

J. B. L. Smith and M. Goto. 3 March 2016. "Using prior expectations to improve structural analysis: A cautionary tale." The Dagstuhl Seminar on Computational Music Structure Analysis.

J. B. L. Smith. 12 Feb. 2015. "Music Information Retrieval research" and "Explaining and predicting perception of musical structure." Two presentations at Pre-workshop Study Day at Raffles Institution, a satellite event to the Mathemusical Conversations. Singapore.

J. B. L. Smith. 25 March 2014. "Using large datasets to understand the perception of structure in music." At the Epstein Institute Seminar Series, University of Southern California, Los Angeles, CA, USA.

Other talks and writings

J. B. L. Smith. 2016. Introduction to "Part IV: Educating the Mathemusical" in *Mathemusical Conversations*, eds. J. B. L. Smith, E. Chew and G. Assayag. 165–7.

B. Rocha., **J. B. L. Smith**, G. Peeters, J. C. Ross, O. Nieto and J. Van Balen. 2012. "Late-break session on music structure analysis." Summary of music structure analysis discussion group at ISMIR unconference-style late-breaking session. Porto, Portugal.

J. B. L. Smith and I. Schankler. Review of The Third International Conference on Mathematics and Computation in Music. *Computer Music Journal* 35:4.

J. B. L. Smith. 26 March 2010. "Methods for the automatic structural analysis of music." Presentation at the CIRMMT Workshop on the Structural Analysis of Music.

J. B. L. Smith. 2 March 2010. "A survey of approaches to the automatic formal analysis of musical audio." Presentation at the McGill Music Technology Colloquium.

Theses

J. B. L. Smith. 2014. Explaining listener differences in the perception of musical structure. Ph.D. thesis, Queen Mary University of London. Advisors: Elaine Chew and Marcus Pearce.

Listeners often disagree about how to describe pieces of music, and this presents a challenge to those aiming to extract descriptions automatically. In four studies in different disciplines, I develop and present evidence to support the hypothesis that attention is a key factor in accounting for listeners' perceptions of boundaries and groupings, and hence a key to explaining their disagreements.

J. B. L. Smith. 2010. A comparison and evaluation of approaches to the automatic formal analysis of musical audio. M.A. thesis, McGill University. Advisor: Ichiro Fujinaga.

Although music structure analysis has been studied for years, evaluation methods have varied significantly regarding metrics, test sets and baselines. For this thesis I assembled a diverse group of algorithms and conducted a large-scale quantitative and qualitative evaluation. I argued for the use of stronger baselines and made my code available for others to use.

J. B. L. Smith. 2006. Testing Zipf's Law: The mathematics and aesthetics of performance. B.A. thesis, Harvard College. Advisor: Hans Tutschku.

For pieces of Classical music, the distributions of note frequencies, note lengths, and many other attributes had been observed to follow a simple power law, known as Zipf's Law. However, it was not known how the act of performance affected these distributions. I collected performance samples from multiple musicians and observed that distributions only seemed to become more random, rather than closer to Zipf's Law.

Peer review and mentorship

Reviewer for the International Society for Music Information Retrieval since 2010. Meta-reviewer since 2015.

Reviewer for *Music Perception* (2015).

Reviewer for *Journal of New Music Research* (2015–16).

Reviewer for *IEEE Transactions on Multimedia* (2017).

Peer mentor for T. Brochier (2010–11), K. Watanabe (2016), L. Yang (2016).

Mentor in "Women in Music Information Retrieval" mentorship program (2017).

Conference organisation

2015	Publication chair for Mathemusical Conversations: Mathematics and Computation in Music Performance and Composition. Singapore.
2014	Volunteer organiser for AES 53rd International Conference on Semantic Audio. London, UK.
2013–2014	External seminar coordinator for the Centre for Digital Music at Queen Mary University of London.
2009	Volunteer organiser for the International Computer Music Conference (ICMC). McGill University, Montreal, QC.

Conferences and workshops attended

(Contributed to work published at all conferences.)

Oct. 23–27, 2017	The 18th International Society for Music Information Retrieval Conference (ISMIR). Suzhou, China.
July 10–14, 2017	The 2017 IEEE International Conference on Multimedia and Expo (ICME). Hong Kong, China.
Aug. 12, 2016.	The 6th annual seminar on Cognitively based Music Informatics Research (CogMIR). New York City, USA.
Aug. 7–11, 2016.	The 17th ISMIR. New York City, USA.
Feb. 28–March 4, 2016	Dagstuhl Seminar on Computational Music Structure Analysis (invited participant). Dagstuhl, Germany.
July 30–Aug. 1, 2015	The 12th Sound and Music Computing Conference (SMC). Maynooth, Ireland.
Feb. 13–15, 2015	Mathemusical Conversations: Mathematics and Computation in Music Performance and Composition (served as Publication Chair). Singapore.
Oct. 27–31, 2014	The 15th ISMIR. Taipei, Taiwan.
Sept. 18–20, 2014	International Conference of Students of Systematic Musicology. London, UK.
Nov. 4–8, 2013	The 14th ISMIR. Curitiba, Brazil.
Oct. 21–25, 2013	The 21st ACM International Conference on Multimedia (ACMMM). Barcelona, Spain.
Aug. 8–11, 2013	The biennial meeting of the Society for Music Perception and Cognition (SMPC). Toronto, ON, Canada.
Dec. 18, 2012	DMRN+7: Digital Music Research Network One-day Workshop. London, UK.
Oct. 8–12, 2012	The 13th ISMIR. Porto, Portugal.
Oct. 24–28, 2011	The 12th ISMIR. Miami, FL.
June 15–17, 2011	International Conference on Mathematics and Computation in Music (MCM). Paris, France.
Nov. 4–7, 2010	American Musicological Society and the Society for Music Theory Annual Meeting (AMS/SMT). Indianapolis, IN.
March 26, 2010	Workshop on Structural Analysis of Music. McGill University, Montreal, QC.
Oct. 26–30, 2009	The 10th ISMIR. Kobe, Japan. Also attended CrestMuse Workshop satellite event in Kyoto on Oct. 31.