

# CURRICULUM VITAE of Marks Ruziboev

## Personal Data

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Address	School of Sciences, Loughborough University, Epinal Way LE11 3TU, Loughborough, UK
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Phone	+ 39 3801043066
Date of Birth	29/09/1987
Place of Birth	Khorezm, Uzbekistan
Nationality	Uzbekistan

## Research Interests

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Ergodic Theory and Dynamical Systems; Random Dynamical Systems; Probability Theory; Mathematical Control Theory

## Employment History

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05/2016 - today | Research Associate, School of Sciences, Loughborough University.

## Short Term Visiting Positions

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02/2016 - 04/2016 | Short term visitor, ICERM, Brown University, Providence, RI, USA.  
09/2015 - 02/2016 | Simons Semester Postdoctoral fellow at IMPAN, Warsaw, Poland.

## Education

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*Ph.D. Dynamical Systems, 2015*

International School for Advanced Studies (SISSA), Trieste, Italy and The Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy.

**Doctoral Advisor:** Stefano Luzzatto

*Diploma in Mathematics, 2011*

The Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy.

**Thesis Advisor:** Stefano Luzzatto

*M.Sc. Mathematics, 2010*

The National University of Uzbekistan, Tashkent, Uzbekistan.

**Thesis Advisor:** Abdulla Azamov

*B. Sc. Mathematics, 2008*

The National University of Uzbekistan Tashkent, Uzbekistan.

**Thesis Advisor:** Abdulla Azamov

## Publications

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1. W. Bahoun, I. Melbourne, M. Ruziboev: Variance continuity for Lorenz flows. Available at [arxiv.org/abs/1812.08998](https://arxiv.org/abs/1812.08998), Preprint (2018).

2. W. Bahsoun, M. Ruziboev, B. Saussol: Linear response for random dynamical systems. Available at [arxiv.org/abs/1710.03706](https://arxiv.org/abs/1710.03706), Preprint (2017).
3. W. Bahsoun, C. Bose, M. Ruziboev: Quenched decay of correlations for slowly mixing systems, Available at [arxiv.org/abs/1706.04158](https://arxiv.org/abs/1706.04158), To appear in *Transactions of AMS*.
4. W. Bahsoun, M. Ruziboev: On the statistical stability of Lorenz attractors with a  $C^{1+\alpha}$  stable foliation. Appeared online in *Ergodic Theory and Dynamical Systems*, (2018).
5. S. Luzzatto, M. Ruziboev: Statistical properties of direct product systems. *Discrete and Continuous Dynamical Systems*, Vol 36, no. 3, 1465-1491, (2016).
6. M. Ruziboev: Decay of correlations for invertible maps with non-Hölder observables. *Dynamical Systems an International Journal*. no. 3, 341-352, (2015).
7. A. Azamov, M. Ruziboev: The time-optimal problem for evolutionary partial differential equations. *Journal of Applied Mathematics and Mechanics*, V. 77, n. 2, 220-224, (2013).
8. M. Ruziboev: The pursuit-evasion problem in a discrete version of the hamstrung car game. *Journal of Applied Mathematics and Mechanics*, V. 72, n 6, 669-672, (2008).

### Reviewed Conference Proceedings

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9. M. Ruziboev: Almost Sure Rates of Mixing for Random Intermittent Maps. In: Azamov A., Bunimovich L., Dzhallilov A., Zhang HK. (editors) *Differential Equations and Dynamical Systems. USUZCAMP 2017. Springer Proceedings in Mathematics & Statistics*, vol 268. Springer, Cham (2018).

### Selected Seminar talks

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- *Quenched decay of correlations for slowly mixing systems*, Dynamical systems seminar at International Centre for theoretical Physics (ICTP), Trieste, Italy, February 19, 2018.
- *Quenched decay of correlations for slowly mixing systems*, Probability and Statistics seminar at Université de Bretagne Occidentale, Brest, France, June 29, 2017.
- *On the stability of statistical properties for the Lorenz flow*, Dynamical systems seminar at International Centre for theoretical Physics (ICTP), Trieste, Italy, April 20, 2017.
- *On the stability of statistical properties for Lorenz attractors with a  $C^{1+\alpha}$  stable foliation*, Ergodic Theory and Dynamical systems seminar at Warwick University, Coventry, UK, January 17, 2017.
- *On the stability of statistical properties for Lorenz flow (Part I, II)* Dynamics seminar at University of Victoria, Victoria, Canada, November 22 and 29, 2016.
- *Young towers for product systems*, IMPAN, Warsaw, Poland, December 1, 2015.
- *Young towers for product systems*, Dynamical Systems seminar at University of Vienna, Vienna, Austria, March 5, 2015.
- *Statistical properties of direct product systems*, Dynamical Systems Seminar at California State University in Irvine, Irvine, USA, May 26, 2014.

### Talks in Conferences and workshops

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- *Quenched decay of correlations for slowly mixing systems*, Invited speaker of *Dynamics Days Europe 2018, 3-7 September*.

- *Quenched decay of correlations for slowly mixing systems*, Invited speaker of The Second USA-Uzbekistan Conference on Analysis and Mathematical Physics, Urgench State University, Urgench, Uzbekistan, August 8-12, 2017.
- *On the stability of statistical properties for the Lorenz flow* Dynamics Day, Loughborough University, Loughborough, UK, April 7-8, 2017.
- *Decay of correlations for continuous observables*, International Conference on Dynamical Systems and Ergodic Theory, Maceio, Brazil, January 25-30, 2015.
- *Gibbs-Markov structures for direct product systems*, ICTP-NLAGA School in Dynamical Systems and Ergodic Theory, Mbour, Senegal, June 4-14, 2014.
- *Statistical properties of direct product systems*, Invited speaker of The First USA-Uzbekistan Conference on Natural Sciences and Mathematics, Fullerton, USA, May 20-23, 2014.
- *Decay of correlations for product systems*, Chaos at Tor Vergata, Rome, Italy, April 2-3, 2014.
- *On the time optimal problem for heat equation*, Control and Optimization of Dynamical System, Tashkent, Uzbekistan, September 27 - October 1, 2009.

## Grants

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- Brazilian-European partnership in Dynamical Systems (BREUDS) funds to visit Institute for Pure and Applied Mathematics (IMPA) from January 5 to March 5, 2015.
- School's travel grant to visit Benoit Saussol in Brest and research school "Analytical aspects of hyperbolic flows" from July 3 to July 7, 2017 at H. Lebesgue center in Nantes.

## Organization of Schools and Conferences

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- Co-organizer of the mini-symposium *Ergodic theory and dynamical systems in Dynamics Days Europe 2018, 3-7 September*;
- Co-organizer of the conference *Aspects of Dynamical Systems*, Imperial College, London, UK, March 16-18, 2017.

## Teaching Experience

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- Lecturer for the course 17MBA141- Analysis III for the 2nd year Mathematics Students at Loughborough University, autumn 2017 (94 students).
- Lecturer for the course 16MAA202 - Mathematics 2 for the 1st year Engineering students at Loughborough University, spring 2017 (128 students).
- Lecturer of the course "Introduction to Dynamical Systems" (with S. Luzzatto) for Postgraduate Diploma students in Mathematics, ICTP, autumn 2014 (10 students).

## Supervision

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- Xian Jie Chen ( B.Sc. thesis jointly supervised with Wael Bahoun), *Central Limit Theorems for Dynamical Systems via Spectral Methods*, 2017.

## **Other Activities**

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Team leader of Loughborough University and the member of jury at the 1st Al-Khorezmi International Mathematical Olympiad for Students

**Programming skills:** Maple, Python

**Language:** English, Russian, Uzbek

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## **References**

### **Professor José Ferreira Alves**

Department of Mathematics, Faculty of Sciences, University of Porto, Porto, Portugal

Phone: (351) 220 402 147

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### **Dr. Wael Bahsoun**

School of Mathematics, Loughborough University, Loughborough, UK.

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### **Professor Gafurjan Ibragimov**

Department of Mathematics, Faculty of Science, UPM, Serdang, Selangor

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### **Professor Stefano Luzzatto**

The Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy.

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### **Professor Benoît Saussol**

Laboratoire de Mathématiques de Bretagne Atlantique, Université de Bretagne Occidentale, Brest, France.

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## TRACK RECORD OF MARKS RUZIBOEV

The applicant received his PhD in mathematics in 2015 from International School of Advanced Studies (SISSA) in Trieste. Since his PhD the applicant has been working on ergodic theory and dynamical systems. In [6], in a joint work with S. Luzzatto, we show that the direct product of maps with Young Towers admits a Young Tower whose return times decay at a rate which is bounded above by the slowest of the rates of decay of the return times of the component maps. In [3], a joint paper with W. Bahsoun and C. Bose, we obtain upper bounds for the rates of decay of quenched correlations on Random Young Towers. As an application we construct such towers for the random compositions of Liverani-Saussol-Vaianti maps. In [5], I was able to construct Random Young Towers for the random compositions of a general family of Markov intermittent maps.

Moreover, in [4], a joint paper with W. Bahsoun, we proved that the Lorenz flow is statistical stable. The main ingredient of the proof is that the corresponding Perron-Frobenius operators on a Banach space of quasi Hölder functions admit a uniform spectral gap. In a joint work [3], with W. Bahsoun and I. Melbourne we prove continuity of the variance in the CLT for perturbations of the Lorenz flow, based on our previous result in [4] and exploring the uniform exponential decay of correlations for the corresponding Poincaré maps.

A combination of spectral and tower techniques were used in [2], a joint work with W. Bahsoun and B. Saussol, where we obtain linear response formula with respect to  $\varepsilon$  for random compositions of maps, chosen independently according to a distribution  $\mathbb{P}_\varepsilon$ , when  $\mathbb{P}_\varepsilon$  depends smoothly on  $\varepsilon$ . We apply our results to i.i.d. compositions, with respect to various distributions  $\mathbb{P}_\varepsilon$ , of uniformly expanding circle maps, Gauss-Rényi maps (random continued fractions) and Pomeau-Manneville maps. Our results yield an exact formula for the invariant density of random continued fractions; while for Pomeau-Manneville maps our results provide a precise relation between their linear response under certain random perturbations and their linear response under deterministic perturbations. The proof consists of two major steps: the first we obtain linear response for induced maps, where we use spectral techniques; then using the linear response formula for the induced maps we obtain linear response formula for the original system.

Moreover, prior to his PhD the applicant worked on optimal control theory in collaboration with Abdulla Azamov, results of which is published in citeAR. The applicant work on game theory [9] was his diploma thesis.

In summary, the applicant has working knowledge in both functional analytic and combinatorial (tower) techniques, which enables him to pursue the aims of the proposal.

## REFERENCES

1. W. Bahsoun, I. Melbourne, M. Ruziboev: Variance continuity for Lorenz flows. Available at [arxiv.org/abs/1812.08998](https://arxiv.org/abs/1812.08998), Submitted.
2. W. Bahsoun, M. Ruziboev, B. Saussol: Linear response for random dynamical systems. Available at [arxiv.org/abs/1710.03706](https://arxiv.org/abs/1710.03706), Submitted.
3. W. Bahsoun, C. Bose, M. Ruziboev: Quenched decay of correlations for slowly mixing systems, Available at [arxiv.org/abs/1706.04158](https://arxiv.org/abs/1706.04158), To appear in Transactions of AMS.
4. W. Bahsoun, M. Ruziboev: On the statistical stability of Lorenz attractors with a  $C^{1+\alpha}$  stable foliation. Appeared online in *Ergodic Theory and Dynamical Systems*, (2018).
5. M. Ruziboev: Almost sure rates of mixing for random intermittent maps. *Proceedings of the Second USA-Uzbekistan Conference on Analysis and Mathematical Physics*, Springer (2018). <https://link.springer.com/book/10.1007/978-3-030-01476-6>.
6. S. Luzzatto, M. Ruziboev: Young Towers for Product Systems. *Discrete and Continuous Dynamical Systems*, Vol 36, no. 3, 1465-1491, (2016).
7. M. Ruziboev: Decay of correlations for invertible maps with non-Hölder observables. *Dynamical Systems an International Journal*. no. 3, 341-352, (2015).
8. A. Azamov, M. Ruziboev: The time-optimal problem for evolutionary partial differential equations. *Journal of Applied Mathematics and Mechanics*, V. 77, n. 2, 220-224, (2013).
9. M. Ruziboev: The pursuit-evasion problem in a discrete version of the hamstrung car game. *Journal of Applied Mathematics and Mechanics*, V. 72, n 6, 669-672, (2008)