

# Curriculum Vitæ

## Ivailo Hartarsky

April 5, 2025

### General Data

#### Identity

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Birth	July 1994, Sofia, Bulgaria	Citizenship	Bulgarian and French
Email	<a href="mailto:ivailo.hartarsky@tuwien.ac.at">ivailo.hartarsky@tuwien.ac.at</a>	Website	<a href="http://www.normalesup.org/~hartarsky">http://www.normalesup.org/~hartarsky</a>
Institution	ICJ, Lyon 1, CNRS	Position	Associate researcher (chargé de recherche)

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#### Languages

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Bulgarian	Mothertongue	C2	German	Intermediate	B2
English	Fluent	C1-C2	Russian	Intermediate	B2
French	Fluent	C1-C2	Portuguese	Beginner	A1

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### Experience

#### Education and employment

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Years	Institution	Position/degree and results
24-	CNRS, Universtié Claude Bernard Lyon 1	Associate researcher (chargé de recherche)
22-24	Technische Universität Wien	Postdoctoral researcher, “Random Surfaces: growth, fluctuations and universality” project of Fabio Toninelli
19-22	Université Paris Dauphine, PSL	PhD supervised by Cristina Toninelli on “Bootstrap percolation and kinetically constrained models: two-dimensional universality and beyond” (Jan 7, 2022)
15-19	Ecole Normale Supérieure, PSL	Diploma of the ENS, requiring a B. Sc., a M. Sc. and a bit over one year of supplementary studies.
17-18	Université Pierre et Marie Curie, Sorbonne Université	Second year of M. Sc. in Mathematics specialised in probability and random processes. GPA 18.5/20.
16-17	Ecole Normale Supérieure, PSL	First year of M. Sc. in Mathematics. GPA 19.2/20.
15-16	Ecole Normale Supérieure, PSL	B. Sc. in Mathematics
15-16	Ecole Normale Supérieure, PSL	B. Sc. in Physics
13-15	Lycée Louis le Grand	CPGE - MPSI - MP* Corresponds to the first two years of B. Sc. with a major in Mathematics and in Physics.
05-13	Sofia High School of Mathematics	Secondary education with intense study of Mathematics. GPA 6.00/6.00.

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As an undergraduate and graduate, I followed several **courses** beyond the diplomas' requirements, namely at ENS, Paris-Sud, Paris Diderot and University of Cambridge. In total the courses I validated over the first 3 years at ENS account for the equivalent of over 6 standard years in terms of ECTS. In high school I participated in 10 **trainings** of the Bulgarian **national team** in Mathematics and 1 training of the Bulgarian national team in Physics and 1 training of the French national team in Physics (each lasting a week or two of intensive courses), as well as in many other additional courses.

## Competitions

From 2002 to 2013 I participated in more than 150 competitions (120 in Mathematics, 20 in Physics and others mainly in Informatics), among which 12 international. I achieved 15 national first places as well as the following most notable distinctions.

Gold medal	Balkan Mathematical Olympiad (BMO)	2013	Mathematics
Silver medal	BMO	2012	Mathematics
Bronze medal	Romanian Master of Mathematics (RMM)	2013	Mathematics
Honourable mention	International Mathematical Olympiad (IMO)	2012	Mathematics
Silver medal	International Zhautykov Olympiad (IZhO)	2013	Physics
Silver medal	IZhO	2012	Physics
National Diploma*		2013	Distinction

These and other achievements led to me receiving about 20 **scholarships** in the period 2006-2014 from the Bulgarian Ministry of Education and Science, “America for Bulgaria” foundation and “Communitas” foundation (about 8k€). In 2013-2015 I was supported by a scholarship from IHESTB and Vallet foundation (about 8k€).

## Teaching and examination

- Second year Master **student seminar** in English on probability supervision, reports grading at ENS Lyon-Université Claude Bernard Lyon 1 in 2025.
- International **student selection** for Ecole Normale Supérieure in 2024 and 2025.
- Problem selection and grading for the annual “Minko Balkanski” national **competition** in Mathematics 2014-2025, including **oral examination** 2020-2025.
- Teacher at “Minu Balkanski” foundation’s annual extracurricular summer schools for middle and high school students: **Combinatorics** in 2018-2023 (20h/year; online in 2020); **Experimental Physics** in 2015-2017 (30h/year).
- Second year **Statistics** lectures, examples class and grading, management bachelor, Paris Dauphine in 2019 (36h in French), 2020 (36h in English, 36h in French, all online), 2021 (36h in English).
- Problem selection and/or grading for the “PPMG Burgas Challenge” national **competition** in Mathematics in 2020 and 2022.
- Extracurricular Mathematics teacher at Parimaths in 2016 and 2019 (12h).

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\*Individual award for students graduating from high school having achieved excellent (6.00/6.00) results in all subjects as well as in the national matriculation examinations and having shown distinguished abilities in science, technology, culture or sport.

## Supervision

- Advanced high school **student projects**: Anton Breskovski (2021), Maria-Kasia Petrova (2023).

## Administrative activity

- Director and co-founder of the annual “Combinatorial Mathematics” **summer school** at “Minu Balkanski” foundation 2018-2022, including online organisation in 2020.
- Co-organiser of the annual “Minko Balkanski” national **competition** 2014-2025 (head 2019-2025).

## Research

Records on [arXiv](#) (hartarsky\_i\_1), [zbMath](#) (hartarsky.ivailo), [MathSciNet](#) (1287028).

## Distinctions

- [EMS Young Academy](#) elected fellow 2025-2028.
- [Prix solennel de thèse](#) of the [Chancellerie des universités de Paris](#).
- [Jacques Neveu thesis prize](#) of the [Société de Mathématiques Appliquées et Industrielles](#).

## Interests

**Areas**: Probability, Combinatorics, Statistical Physics

**Keywords**: Kinetically constrained spin models, Bootstrap percolation, Oriented percolation, Probabilistic cellular automata, Interacting particle systems, Stochastic dynamics, Relaxation and mixing times, Glassy dynamics

## Preprints

- (1) IH, L. Lichev *Explosive appearance of cores and bootstrap percolation on lattices*. [arXiv: 2501.18976](#), 30pp.
- (2) <sup>†</sup>IH, A. Teixeira *Bootstrap percolation is local*. [arXiv:2404.07903](#), 62pp.

## Publications

- (3) E. Archer, IH, B. Kolesnik, S. Olesker-Taylor, B. Schapira, D. Valesin *Catalan percolation*. To appear in *Probability Theory and Related Fields*. [arXiv: 2404.19583](#), 29pp.
- (4) IH, A. Teixeira *Locality approach to the bootstrap percolation paradox*. Editor’s suggestion in [Physical Review Letters](#) (2025), 134, 117102. [arXiv:2410.01619](#), 6+3pp.
- (5) IH, L. Lichev, F. Toninelli *Local dimer dynamics in higher dimensions*. To appear in [Annales de l’Institut Henri Poincaré D, Combinatorics, Physics and their Interactions](#). [arXiv:2304.10930](#), 15pp.

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<sup>†</sup>Selected publication.

- (6) †H. Duminil-Copin, IH *Sharp metastability transition for two-dimensional bootstrap percolation with symmetric isotropic threshold rules*. [Probability Theory and Related Fields](#) (2024), 190(1-2), 445–483. [arXiv:2303.13920](#), 39pp.
- (7) †IH, F. Toninelli *Kinetically constrained models out of equilibrium*. [Probability and Mathematical Physics](#) (2024), 5(2), 461–489. [arXiv:2212.08437](#), 29pp.
- (8) †IH *Refined universality for critical KCM: upper bounds*. [Communications in Mathematical Physics](#) (2024), 405(1), Paper 13. [arXiv:2104.02329](#), 68+16pp.
- (9) IH, L. Lichev *The maximal running time of hypergraph bootstrap percolation*. [SIAM Journal on Discrete Mathematics](#) (2024), 38(2), 1462–1471. [arXiv:2208.13489](#), 10pp.
- (10) G. Brigati, IH *The normal contraction property for non-bilinear Dirichlet forms*. [Potential analysis](#) (2024), 60, 473–488. [arXiv:2205.02928](#), 16pp.
- (11) IH, L. Lichev *Brownian snails with removal die out in one dimension*. [Electronic Communications in Probability](#) (2023), 28. [arXiv:2305.10751](#), 8pp.
- (12) IH *Sensitive bootstrap percolation second term*. [Electronic Communications in Probability](#) (2023), 28. [arXiv:2303.14910](#), 7pp.
- (13) †IH, F. Martinelli, C. Toninelli *Sharp threshold for the FA-2f kinetically constrained model*. [Probability Theory and Related Fields](#) (2023), 185(3), 993–1037. [arXiv:2012.02557](#), 45pp.
- (14) IH, R. Szabó *Subcritical bootstrap percolation via Toom contours*. [Electronic Communications in Probability](#) (2022), 27. [arXiv:2203.16366](#), 13+2pp.
- (15) IH *Bootstrap percolation, probabilistic cellular automata and sharpness*. [Journal of Statistical Physics](#) (2022), 187(3), Article 21. [arXiv:2112.01778](#), 17pp.
- (16) IH, R. Szabó *Generalised oriented site percolation*. [Markov Processes and Related Fields](#) (2022), 28(2). [arXiv:2103.15621](#), 28pp.
- (17) IH, L. Marêché *Refined universality for critical KCM: lower bounds*. [Combinatorics, Probability & Computing](#) (2022), 31(5), 879–906. [arXiv:2011.06952](#), 28+16pp.
- (18) IH, B. N. B. de Lima *Weakly constrained-degree percolation on the hypercubic lattice*. [Stochastic processes and their applications](#) (2022), 153, 128–144. [arXiv:2010.08955](#), 17pp.
- (19) IH, F. Martinelli, C. Toninelli *Coalescing and branching simple symmetric exclusion process*. [The Annals of Applied Probability](#) (2022), 32(4), 2841–2859. [arXiv:2006.01426](#), 19pp.
- (20) IH *Bisection for kinetically constrained models revisited*. [Electronic Communications in Probability](#) (2021), 26. [arXiv:2104.07883](#), 10pp.
- (21) IH, F. Martinelli, C. Toninelli *Universality for critical KCM: finite number of stable directions*. [The Annals of Probability](#) (2021), 49(5), 2141–2174. [arXiv:1910.06782](#), 34pp.
- (22) IH  *$\mathcal{U}$ -bootstrap percolation: critical probability, exponential decay and applications*. [Annales de l'Institut Henri Poincaré B](#) (2021), 57(3), 1255–1280. [arXiv:1806.11405](#), 26pp.

- (23) IH, L. Marêché, C. Toninelli *Universality for critical KCM: infinite number of stable directions*. *Probability Theory and Related Fields* (2020), 178(1), 289–326. [arXiv:1904.09145](#), 38pp.
- (24) IH, T. R. Mezei *Complexity of two-dimensional bootstrap percolation difficulty: Algorithm and NP-hardness*. *SIAM Journal on Discrete Mathematics* (2020), 34(2), 1444–1459. [arXiv:1809.01525](#), 16pp.
- (25) S. David, IH, M. Tiba *Strong Ramsey games in unbounded time*. *European Journal of Combinatorics* (2020), 86, 103096. [arXiv:1710.09955](#), 26pp.
- (26) IH, M. Baity-Jesi, R. Ravasio, A. Billoire, G. Biroli *High-energy records in glassy energy landscapes*. *Journal of Statistical Mechanics: Theory and Experiment* (2019), 093302. [arXiv:1904.08024](#), 24pp.
- (27) IH, R. Morris *The second term for two-neighbour bootstrap percolation in two dimensions*. *Transactions of the AMS* (2019), 372, 6465–6505. [arXiv:1806.08931](#), 41+14pp.
- (28) IH *Maximal bootstrap percolation time on the hypercube via generalised snake-in-the-box*. *Electronic Journal of Combinatorics* (2018), 25(3), Paper 3.10. [arXiv:1707.09214](#), 12pp.

### Books, surveys and proceedings

- (29) <sup>†</sup>IH, C. Toninelli *Kinetically constrained models*. To appear in Springer Briefs series. [arXiv:2412.13634](#), vi+115pp.
- (30) IH *Universalité des modèles de percolation bootstrap et cinétiquement contraints en deux dimensions*. *Matapli* (2024), 133, 49–64. [HAL-04427412](#), 16pp.
- (31) IH, F. Martinelli, C. Toninelli *Fredrickson–Andersen model in two dimensions*. *ESAIM: Proceedings and Surveys* (2023), 74, 108–118. [arXiv:2205.02297](#), 11pp.

### Supervised written works

- (1) IH *Bootstrap percolation and kinetically constrained models: two-dimensional universality and beyond*, PhD thesis, Supervisor: Cristina Toninelli, 2022, xxvi+434pp.
- (2) IH *Percolation bootstrap et modèles cinétiquement contraints* (Bootstrap percolation and kinetically constrained models), ENS diploma thesis, Supervisor: Cristina Toninelli, 2018, 22pp.
- (3) IH  *$\mathcal{U}$ -bootstrap percolation: critical probability, exponential decay and applications*, Master thesis, Supervisor: Cristina Toninelli, 2018, 42pp. Grade 20/20.
- (4) IH *Glassy dynamics: Trap and Random energy models*, Internship Report, ENS, Supervisors: Giulio Biroli and Justin Salez, 2016, 53pp. Grade 18/20.
- (5) IH *Optimisation d'un jeu de type bataille navale* (Optimisation of a sea battle-type game), Coursework for Mathematical and Numerical Modelisation, ENS, Supervisor: Bertrand Maury, 2016, 22pp. Grade 19/20.
- (6) IH *Sur l'expérience de Mayer* (On the Mayer experiment), TIPE, Supervisor: Jean-François Logeais, 2015, 12pp. Grade 18/20.

- (7) ИИ *Върху Теоремата на Ердьос-Гинсбург-Зив* (On the Erdős–Ginzburg–Ziv theorem), Ученически Институт по Математика и Информатика (Students' Institute of Mathematics and Informatics), Лятна Изследователска Школа (Summer School), Supervisor: Emil Kolev, 2010, 12pp.
- (8) ИИ *Поглед върху неравенството на Несбит* (A look into Nesbitt's inequality), Ученически Институт по Математика и Информатика (Students' Institute of Mathematics and Informatics), Зимна конференция (Winter conference), Supervisor: Veliko Kolev, 2009.

### Editorial/reviewer activity

- Editor of the report of the Oberwolfach workshop 2237 "Large Scale Stochastic Dynamics".
- Reviewed about 20 papers for *ALEA*; *Annals of Applied Probability*; *Annals of Combinatorics*; *Bulletin of the London Mathematical Society*; *Combinatorial Theory*; *Combinatorics, Probability & Computing*; *Electronic Communications in Probability*; *Electronic Journal of Combinatorics*; *Electronic Journal of Probability*; *Inventiones Mathematicae*; *Involve*; *Journal of Statistical Physics*; *Memoirs of the American Mathematical Society*; *Methodology and Computing in Applied Probability*; *Monatshefte für Mathematik*; *Probability Theory and Related Fields*; *Random Structures and Algorithms*; *Theoretical Computer Science*, as well as for MathSciNet.

### Research internships

- One year full-time probability and statistical physics internship at CEREMADE, Université Paris Dauphine supervised by Cristina Toninelli (CEREMADE, Paris 9) on kinetically constrained models and bootstrap percolation. 10.18-7.19
- Eight month part-time probability and statistical physics internship (mémoire de M2) at LPSM (formerly LPMA), Université Paris-Diderot supervised by Cristina Toninelli (LPSM, Paris 7) on kinetically constrained models and bootstrap percolation. 10.17-6.18
- Six month full-time probability and combinatorics internship at the DPMMS, University of Cambridge (out of which one month at IMT Lucca) supervised by Béla Bollobás (University of Cambridge and University of Memphis) on bootstrap percolation. 1.17-7.17
- One month full-time statistical physics internship at IPhT, CEA-Saclay supervised by Giulio Biroli (CEA and ENS) and Justin Salez (LPMA, Paris 7) on the dynamics of glassy systems and the trap model. 6.16-7.16

### Academic visits

- Roma Sapienza, Italy, Alessandra Faggionato, 1 week, 12.24.
- Groningen, Netherlands, Réka Szabó, 1 week, 5.24.
- IST, Lisboa, Portugal, Augusto Teixeira, 1 week, 7.23.
- IMPA, Rio de Janeiro, Brazil, Augusto Teixeira, 2.5 months, 4-6.22.
- Roma Tre, Italy, Fabio Martinelli, 1 week, 2.20.
- EPFL, Lausanne, Switzerland, Laure Marêché, 1 week, 1.20.

- Minu Balkanski foundation, Oryahovitsa, Bulgaria, with Marius Tiba, 1 week, 7.19.
- Roma Tre, Italy, Fabio Martinelli, 1 week, 3.19.
- Roma Tre, Italy, Fabio Martinelli, 1 week, 10.18.
- ETH Zurich, Switzerland, Vincent Tassion, 3 days, 5.18.
- IMT Lucca, Italy, with Béla Bollobás' group, 1 month, 5.17

## Talks

### Invited

- Strasbourg, séminaire calcul stochastique, *Catalan percolation*, 21.1.25.
- “Percolation Today” international online seminar. *Catalan percolation*, [video](#), joint with Bruno Schapira, 20.1.25.
- Lyon 1, journée de rentrée de l'ICJ. *Localité en percolation bootstrap*, 8.1.25.
- Sapienza, Rome. Probability seminar. *Catalan percolation*, 16.12.24.
- MFO, Oberwolfach, “Mixing Times in the Kardar-Parisi-Zhang Universality Class” mini-workshop. *Local dynamics for 3d dimers*, 20.11.24.
- ISTA, Klosterneuburg, “Probability meets Combinatorics” workshop. *Catalan percolation*, 16.10.24.
- SMAI, Poitiers, Journées «Modélisation Aléatoire et Statistique», prix Neveu. *Localité en percolation bootstrap*, 29.8.24.
- ‡“Seminário de Probabilidade e Mecânica Estatística” international online seminar. *Bootstrap percolation is local*, [video](#), 26.6.24.
- Rome, 4th Italian Meeting on Probability and Mathematical Statistics, “Combinatorial structures in probability and statistics” session. *Bootstrap percolation is local*, 11.6.24.
- ‡Utrecht, “Mark Kac” seminar. *Bootstrap percolation is local*, 17.5.24.
- Groningen, Probability and Discrete Mathematics Seminar. *Catalan percolation*, 14.5.24.
- Vienna, “(Not So) Informal Probability Seminar”. *Bootstrap percolation is local*, 2.5.24.
- ‡BIRS, Banff, “Bootstrap percolation and its applications” workshop. *2-neighbour bootstrap percolation on the plane*, mini-course, joint with Rob Morris, [videos: 1, 2, 3](#), 15-16.4.24.
- Lyon 1/ENS Lyon, Probability seminar. *Two-neighbour bootstrap percolation and the Fredrickson-Andersen model*, 7.12.23.
- Innsbruck, “Inn’formal Probability Seminar”. *Kinetically constrained models out of equilibrium*, 28.11.23.

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‡Selected talk.

- ‡CRM, Barcelona, “Discrete probability days” workshop. *Kinetically constrained models out of equilibrium*, 18.10.23.
- Bath, “Probability theory” focused research group. *Kinetically constrained models out of equilibrium*, 11.9.23.
- ‡Lisboa, “Stochastic processes and their applications” conference, “Interacting particle systems” session. *Kinetically constrained models out of equilibrium*, 26.7.23.
- IMI-BAS, Sofia, “Recent Developments in Stochastic Processes” conference. *Two neighbour bootstrap percolation and Fredrickson–Andersen model*, 28.3.23.
- Vienna, “(Not So) Informal Probability Seminar”. *Universality in bootstrap percolation and kinetically constrained models*, 26.1.23.
- ‡IST Austria, Vienna Probability Seminar. *Two neighbour bootstrap percolation and Fredrickson–Andersen model*, 14.12.22.
- UC Davis, online, Probability seminar. *Bootstrap percolation and cellular automata with death*, 18.10.22.
- Inria Lille, “Asymmetry in interacting particle systems, microscopic and macroscopic effects” workshop. *Bootstrap percolation and cellular automata with death*, 5.10.22.
- ‡BIRS, Banff, “Markov Chains with Kinetic Constraints and Applications” workshop. *Introduction to bootstrap percolation and kinetically constrained models*, 4.7.22.
- PUC, Rio de Janeiro, Colóquio Interinstitucional Modelos Estocásticos e Aplicações, *Universality in bootstrap percolation and kinetically constrained models*, 15.6.22.
- ‡IMPA, Rio de Janeiro, online, Seminário de Probabilidade e Mecânica Estatística. *Two-dimensional universality in bootstrap percolation and kinetically constrained models*, [video](#), 25.5.22.
- IMI-BAS, Sofia, online, Algebra and Logic seminar. *Bootstrap percolation: merging operations for polytopes*, [video](#), 20.5.22.
- Paris Dauphine, CEREMADE PhD day. *Fredrickson-Andersen 2-spin facilitated KCM*, 22.3.22.
- Saint-Pierre-Canivet, CEREMADE young researchers winter school. Course *Introduction to dynamics of interacting particle systems*, 1.3.22.
- Rennes 1, Séminaire de Probabilités, online. *Universality in bootstrap percolation and kinetically constrained models*, 10.1.22.
- Rouen Normandie, Rencontres de Probabilités. *Bisection for kinetically constrained models*, 22.10.21.
- Aix-Marseille, Séminaire de probabilités de Marseille, online. *Universality in bootstrap percolation and kinetically constrained models*, 24.9.21.
- SMAI, online, Journées «Modélisation Aléatoire et Statistique», Percolation session. *Weakly constrained-degree percolation*, 26.8.21.



- ‡“Percolation Today” international online seminar. *Generalised oriented site percolation and its relation to bootstrap percolation*, [video](#), joint with Réka Szabó, 13.4.21.
- Paris Dauphine, online, analysis-probability seminar. *Coalescing and branching simple exclusion and Fredrickson-Andersen models*, 2.6.20.
- Simon Fraser, Vancouver, CanaDAM conference, mini-symposium “bootstrap percolation”. *The second term for two-neighbour bootstrap percolation in two dimensions*, 28.5.19.
- Paris Diderot, Groupe de travail des thésards du LPSM. *Universality for critical kinetically constrained models*, 11.2.19.
- Roma Tre, seminar. *Bootstrap percolation: subcritical universality class and oriented percolation*, 24.10.18.

## Contributed

- Innsbruck, Austrian Stochastics Days, “Probabilistic combinatorics” session. *Catalan percolation*, 6.9.24.
- ‡MFO, Oberwolfach, “Large Scale Stochastic Dynamics” workshop. *Attractive probabilistic cellular automata*, 14.9.22.
- Paris Dauphine, thesis defense. *Bootstrap percolation and kinetically constrained models: two-dimensional universality and beyond*, 7.1.22.
- Paris Dauphine, Young Researchers’ Seminar. *Universality in bootstrap percolation*, 14.10.21.
- Random Networks and Interacting Particle Systems online junior conference. *Coalescing and branching simple exclusion and Fredrickson-Andersen models*, 8.9.21.
- Bernoulli-IMS One World Symposium, Probabilistic models in Physics session. *Fredrickson–Andersen model and bootstrap percolation*, [video](#), 8.20.
- ‡MFO, Oberwolfach, “Large Scale Stochastic Dynamics” workshop. *Universality for critical kinetically constrained models*, 20.9.19.
- CIRM, Marseille, GRAAL summer school. *Subcritical bootstrap percolation*, 3.7.19.
- Paris Diderot, Les probabilités de demain. *The second term for two-neighbour bootstrap percolation in two dimensions*, [video](#), 14.6.19.

## Science popularisation

- TU Vienna, “De Leidsche Flesch” visit. *Bootstrap percolation*, 19.1.24.
- “Minu Balkanski” foundation, Oryahovitsa. *Slow bootstrap percolation*, 1.8.23.
- “Minu Balkanski” foundation, Oryahovitsa. *Bootstrap percolation*, 27.8.22.