

# CV

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## CURRENT POSITION

Since 01/02/2015: Associate Professor in Probability and Mathematical Statistics at the Department of Mathematics of the Università degli Studi di Milano.

01/06/2006 – 31/01/2015: Researcher in Probability and Mathematical Statistics at the Department of Mathematics of the Università degli Studi di Milano.

## GRADUATED STUDIES

- 29/01/2007 PhD in Mathematics at the University of Milan with the thesis “Methods of Geometric Measure Theory in Stochastic Geometry” (Advisor: Prof: Vincenzo Capasso, University of Milan)
- 19/12/2002 Degree in Mathematics (110/110 cum laude) with the thesis “Hazard function per processi stocastici geometrici” (Advisor: Prof: Vincenzo Capasso, University of Milan)

## INVITED RESEARCH VISITS

- 11–12/05/2007 Scuola Normale Superiore, Pisa (invited by Prof. L.Ambrosio)
- 20–21/05/2008 Scuola Normale Superiore, Pisa (invited by Prof. L.Ambrosio)
- 30 October 2009—7 November 2009 IMM-RWTH University Aachen, Germany (invited by Prof P.R.Rios and Prof G.Gottstein).
- 4 June 2010—12 June 2010 IMM-RWTH University Aachen, Germany (invited by Prof P.R.Rios and Prof G.Gottstein).
- 22 May 2011—4 June 2011 EIIM-Universidade Federal Fluminense Volta Redonda (RJ), and PUC-Rio de Janeiro (RJ), Brazil (invited by Prof P.R.Rios and Prof I.Bott)
- 3 June 2012—16 June 2012 EIIM-Universidade Federal Fluminense Volta Redonda (RJ), and PUC-Rio de Janeiro (RJ), Brazil (invited by Prof P.R.Rios and Prof I.Bott)

## PARTICIPATIONS TO MEETINGS, TALKS and SEMINARS

- 16/01/2004 Participation to the Workshop “Random Geometries in Biomedicine - Industrial Days”, Milan (Italy).
- 23—26 March 2004 Participation to the conference “Karlsruher Stochastik-Tage 2004. German Open Conference in Probability and Statistics”, Karlsruhe (Germany), giving a talk entitled “Survival functions and contact distribution functions for inhomogeneous stochastic geometric marked point processes”.
- 03/05/2004 Participation to the Workshop “Crystals (Formation, Growth and Simulations) - Industrial Days”, Milan, (Italy).
- 23 February—3 March 2004 Participation to the Workshop “Stochastic Geometry and Spatial Statistics”, Freudenstadt (Germany).
- 4-6 September 2005: Participation to the Workshop “Math Everywhere-Deterministic and Stochastic Modelling in Biomedicine, Economics and Industry”, Milan (Italy), and presentation of the poster “Random Sets as Distributions”.
- 26–29 June 2006 Participation to the Conference “Stereology, Spatial Statistics and Stochastic Geometry”, Prague (Czech Republic), giving a talk entitled “Some remarks on the continuity of random closed sets”.
- 4-9 February 2007 Participation to the Workshop “XVII Giornate di lavoro su questioni di Teoria Geometrica della Misura e di Calcolo delle Variazioni”, Levico Terme (Italy).
- 4-7 March 2008 Participation to the conference “8th German Open Conference on Probability and Statistics”, Aachen (Germany), giving a talk entitled “Mean density of inhomogeneous Boolean models with lower dimensional typical grain”.
- 30 April 2009 Participation to the Workshop “Giornata di studio su problemi a discontinuità libera e problemi multi-scala”, giving a talk (invited) entitled “Applicazioni di Teoria Geometrica della Misura allo studio delle densità medie di insiemi aleatori”
- 22–26 June 2009 Participation to the Congress “ECS10. The 10th European Congress of Stereology and Image Analysis”, Milan, giving a talk entitled “Specific area and mean surface density of inhomogeneous Boolean models”
- 2 November 2009 Invited seminar “Application to Stochastic Geometry to Transformation Kinetics Theories”, CCES-RWTH University, Aachen, Germany
- 30 May - 4 June 2010 Participation to the Workshop “Convex and Stochastic Geometry”, Bad Herrenalb (Germany), giving a talk (invited) entitled “On the differentiability of the spherical contact distribution function of inhomogeneous Boolean models”
- 10 June 2010 Invited seminar (by Prof. Christof Melcher RWTH-Aachen University, Dept.of Mathematics): “On the outer Minkowski content of sets. Results and applications”
- 16–17 February 2011 Participation to the Workshop “Shape and size in Medicine, Biotechnology, Material Science and Social Sciences”, Milan, giving a talk entitled “Stochastic Geometry and Geometric Measure Theory in the study of Birth-and-Growth Processes ”

- 26 May 2011 Invited seminar (by Prof. I. Bott, Pontificia Universidade Catolica do Rio de Janeiro, Departamento de Engenharia de Materiais ): “Stochastic Geometry & Transformation Kinetics Theories: basics and results”
- 7–8 September 2011 Participation to the Workshop ”Deterministic and stochastic methods in evolution problems”, Universita’ di Parma
- 1–3 March 2012 Participation to the Workshop “Curvature measures and integral geometry”, Prague, giving a lectured (invited) entitled “Volume function and boundary measure of parallel sets: differentiability and related results”
- 12 June 2012 Invited seminar (by Prof. J.A. Oliveira Huguenin, Departamento de Física, Universidade Federal Fluminense Volta Redonda (RJ), Brazil): “Stochastic Geometry & Transformation Kinetics Theories: basics and results”
- 14 June 2012 Invited seminar (by Prof. I. Bott, Pontificia Universidade Catolica do Rio de Janeiro, Departamento de Engenharia de Materiais ): “Modelling some recrystallization processes with random growth velocity of the grains”
- 23–27 July 2012 Participation to the “17th European Conference on Mathematics for Industry 2012”, Lund (Sweden), giving a talk entitled “Modelling some recrystallization processes with random growth velocity of the grains”.
- 9–12 July 2013 Participation to the “11th European Congress of Stereology and Image Analysis 2013”, Kaiserslautern (Germany), giving a talk entitled “On the estimation of the mean density of random closed sets”.
- 20–25 July 2013 Participation to the “19th European Meeting of Statisticians”, Budapest (Hungary), giving a talk entitled “Kernel Estimation of Mean Densities of Random Closed Sets”.
- 21–22 May 2014 Invited speaker at the workshop “Geometric Topological and Graphical Model Methods in Statistics”, Toronto (Canada), giving a lecture entitled “Different kinds of estimators of the mean density of random closed sets: theoretical results and numerical experiments”.
- 22 November 2014 Participation to the “8th International Conference on Applied Mathematics, Simulation, Modelling”, Firenze, giving a talk (invited) entitled “Mean density of random closed sets and their estimation: some results and applications”.
- 9 March 2015 Universita’ di Roma Tor Vergata, Dept. of Mathematics, lecture: “Minkowski content and mean density of random closed sets:some theoretical results and statistical applications”
- 29 May 2015 Universita’ Cattolica di Brescia, Dept. of Mathematics and Physics, lecture (invited): “Sulla stima della densità media di insiemi aleatori chiusi”.
- 21 April 2016 Universita’ di Roma Tor Vergata, Dept. of Mathematics, lecture (invited): “Asymptotic results for estimators of the mean density of random closed sets and of the intensity of point processes”

## **PARTICIPATION TO SCHOOLS**

- 13–18 September 2004 Participation to the CIME Summer School “Stochastic geometry”, Martina Franca (Italy).
- 27 June–2 July 2005 Participation to the CIME Summer School “Calculus of variations and non linear partial differential equations”, Cetraro (Italy).

## **TEACHING**

- 2004/05 Assistant lecturer, Analisi I (for Ingegneria Informatica at Politecnico of Milan)
- 2004/05 Assistant lecturer, Matematica II: Probabilità e Statistica (for Ingegneria Elettrica at Politecnico of Milan)
- 2006/07 Assistant lecturer, Calcolo delle Probabilità e Statistica Matematica 2 (for Matematica per le Applicazioni at the University of Milan)
- 2006/07 Lecturer, Laboratorio di Calcolo delle Probabilità e Statistica Matematica (for Matematica at the University of Milan)
- 2007/08 Assistant lecturer, Calcolo delle Probabilità e Statistica Matematica 2 (for Matematica per le Applicazioni at the University of Milan)
- 2007/08 Lecturer, Laboratorio di Calcolo delle Probabilità e Statistica Matematica (for Matematica at the University of Milan)
- 2008/09 Assistant lecturer, Calcolo delle Probabilità e Statistica Matematica 2 (for Matematica per le Applicazioni at the University of Milan)
- 2008/09 Lecturer, Laboratorio di Calcolo delle Probabilità e Statistica Matematica (for Matematica at the University of Milan)
- 2009/10 Assistant lecturer, Calcolo delle Probabilità e Statistica Matematica 2 (for Matematica per le Applicazioni at the University of Milan)
- 2009/10 Lecturer, Laboratorio di Calcolo delle Probabilità e Statistica Matematica (for Matematica at the University of Milan)
- 2010/11 Assistant lecturer, Statistica Matematica (for Matematica at the University of Milan)
- 2010/11 Assistant lecturer, Laboratorio di Calcolo delle Probabilità e Statistica Matematica 1 (for Matematica at the University of Milan)
- 2010/11 Lecturer, Laboratorio di Metodi Matematici e Statistici (for Scienze Biologiche at the University of Milan)
- 2011/12 Assistant lecturer, Calcolo delle Probabilità e Statistica Matematica 2 (for Matematica at the University of Milan)
- 2011/12 Assistant lecturer, Laboratorio di Calcolo delle Probabilità e Statistica Matematica 1 (for Matematica at the University of Milan)
- 2011/12 Lecturer, Laboratorio di Metodi Matematici e Statistici (for Scienze Biologiche at the University of Milan)
- 2012/13 Assistant lecturer, Laboratorio di Calcolo delle Probabilità e Statistica Matematica 2 (for Matematica at the University of Milan)
- 2012/13 Assistant lecturer, Laboratorio di Calcolo delle Probabilità e Statistica Matematica 1 (for Matematica at the University of Milan)
- 2012/13 Lecturer, Laboratorio di Metodi Matematici e Statistici (for Scienze Biologiche at the University of Milan)
- 2012/13 Assistant lecturer, Statistica Matematica (for Matematica at the University of Milan)

2013/14 Assistant lecturer, Laboratorio di Calcolo delle Probabilità e Statistica Matematica 2 (for Matematica at the University of Milan)

2013/14 Assistant lecturer, Laboratorio di Calcolo delle Probabilità e Statistica Matematica 1 (for Matematica at the University of Milan)

2013/14 Assistant lecturer, Calcolo delle Probabilità e Statistica Matematica 1 (for Matematica at the University of Milan)

2013/14 Assistant lecturer, Statistica Matematica (for Matematica at the University of Milan)

2014/15 Assistant lecturer, Laboratorio di Calcolo delle Probabilità e Statistica Matematica 2 (for Matematica at the University of Milan)

2014/15 Assistant lecturer, Laboratorio di Calcolo delle Probabilità e Statistica Matematica 1 (for Matematica at the University of Milan)

2014/15 Assistant lecturer, Calcolo delle Probabilità e Statistica Matematica 1 (for Matematica at the University of Milan)

2015/16 Lecturer, Geometria Stocastica, (for Matematica at the University of Milan)

2015/16 Lecturer, Laboratorio di Metodi Matematici e Statistici (for Scienze Biologiche at the University of Milan)

2015/16 Lecturer, Calcolo delle Probabilità e Statistica Matematica 1 (for Matematica at the University of Milan)

2015/16 Lecturer, Laboratorio di Calcolo delle Probabilità e Statistica Matematica 1 (for Matematica at the University of Milan)

2016/17 Lecturer, Calcolo delle Probabilità e Statistica Matematica 1 (for Matematica at the University of Milan)

2017/18 Assistant lecturer, Calcolo delle Probabilità e Statistica Matematica 1 (for Matematica at the University of Milan)

2017/18 Lecturer, Laboratorio di Calcolo delle Probabilità e Statistica Matematica 1 (for Matematica at the University of Milan)

2017/18 Lecturer, Geometria Stocastica, (for Matematica at the University of Milan)

2017/18 Lecturer, Laboratorio di Metodi Matematici e Statistici (for Scienze Biologiche at the University of Milan)

#### **PhD COURSES HELD:**

- 23 May—2 June 2011, “Stochastic Geometry in Crystallization Processes”, EIIM-Universidade Federal Fluminense of Volta Redonda (RJ), Brazil
- 4 June 2012—13 June 2012, “Stochastic Geometry tools for modelling birth-and-growth processes with cluster nucleation”, EIIM-Universidade Federal Fluminense of Volta Redonda (RJ), Brazil

#### **ELSE:**

- Reviewer for Mathematical Reviews
- Referee for “Communication in Applied and Industrial Mathematics”; “Communications in Statistics - Theory and Methods”; “Journal of Multivariate Analysis”; “Journal of Applied Probability”; “Electronic Journal of Statistics”

- 9 December 2010, member of the PhD Commettee for the PhD defence of Bruno Galerne, Ecole Normale Supérieure de Cachan.
- December 2012: National (Italian)Scientific Habilitation as Associate Professor in Mathematical Analysis, Probability and Mathematical Statistics.
- July 2015: Reviewer for an international project proposal (Czech Science Foundation)

## PUBLICATIONS

### *On referred Journals*

1. Capasso V., Villa E.: Survival functions and contact distribution functions for inhomogeneous, stochastic geometric marked point processes, *Stoch. An. Appl.*, **23**, 79–96 (2005)
2. Capasso V., Villa E.: On the continuity and absolute continuity of random closed sets, *Stoch. An. Appl.*, **24**, 381–397 (2006)
3. Capasso V., Villa E.: On mean densities of inhomogeneous geometric processes arising in material science and medicine, *Image Anal. Stereol.*, **26**, 23–36 (2007)
4. Villa E.: A note on mean volume and surface densities for a class of birth-and-growth stochastic processes, *Int. J. Contemp. Math. Sci.*, **3**, 1141–1155 (2008)
5. Capasso V., Villa E.: On the geometric densities of random closed sets, *Stoch. Anal. Appl.*, **26**, 784–808 (2008)
6. Ambrosio L., Colesanti A., Villa E.: Outer Minkowski content for some classes of closed sets, *Math. Ann.*, **342**, 727–748 (2008)
7. Rios P.R., Villa E.: Transformation kinetics for inhomogeneous nucleation, *Acta Materialia*, **57**, 1199–1208 (2009)
8. Villa E.: On the outer Minkowski content of sets, *Ann. Mat. Pura Appl.*, **188**, 619–630 (2009)
9. Ambrosio L., Capasso V., Villa E.: On the approximation of mean densities of random closed sets, *Bernoulli*, **15**, 1222–1242 (2009)
10. Villa E., Rios P.R.: Transformation kinetics for nucleus clusters, *Acta Materialia*, **57**, 3714–3724 (2009)
11. Rios P.R., Jardim D., Assis W., Caneda T., Villa E.: Inhomogeneous Poisson point process nucleation: comparison of analytical solution with cellular automata simulation, *Mat. Res.*, **12**, 219–224 (2009)
12. Villa E., Rios P.R.: Transformation kinetics for surface and bulk nucleation, *Acta Materialia*, **58**, 2752–2768 (2010)
13. Villa E.: Mean densities and spherical contact distribution function of inhomogeneous Boolean models, *Stoch. Anal. Appl.*, **28**, 480–504 (2010)

14. Villa E.: On the specific area of inhomogeneous Boolean models. Existence results and applications, *Image Anal. Stereol.*, **29**, 111–119 (2010)
15. Rios P.R., Villa E.: Simultaneous and Sequential Transformations, *Acta Materialia*, **59**, 1639–1643 (2011)
16. Villa E., Rios P.R.: Transformation kinetics for nucleation on random planes and lines, *Image Anal. Stereol.*, **30**, 153–165 (2011)
17. Rios P.R., Villa E.: An analytical approach to the effect of a distribution of growth velocities on recrystallization kinetics, *Scripta Materialia*, **65**, 938–941 (2011)
18. Rios R.R., Villa E., Assis W.L.S., Ribeiro T.C.S.: Kinetics of transformations nucleated on random parallel planes: analytical modelling and computer simulation, *Model. Simul. Mater. Sc. Eng.* **20**, (2012) 035017 (12pp)
19. Villa E., Rios P.R.: On modelling recrystallization processes with random growth velocities of the grains in Materials Science, *Image Anal. Stereol.*, **31**, 149–162 (2012)
20. de Oliveira S., Assis W., Villa E., Rios P.R.: Computer simulation of simultaneous evolution of individual texture components during recrystallization of an IF steel, *Mat. Res.*, **16**, 1195–1202 (2013)
21. Villa E.: On the local approximation of mean densities of random closed sets, *Bernoulli*, **20**, 1–27 (2014)
22. Camerlenghi F., Capasso V., Villa E.: On the estimation of the mean density of random closed sets. *J. Multivariate Anal.*, **125**, 65–88 (2014)
23. Camerlenghi F., Villa E.: Optimal bandwidth of the “Minkowski content”-based estimator of the mean density of random closed sets: theoretical results and numerical experiments. *J. Math. Imaging Vision*, **53**, 264–287 (2015)
24. Lussardi L., Villa E.: A general formula for the anisotropic outer Minkowski content of a set. *Proc. Roy. Soc. Edinburgh: Sect. A Mathematics*, **146**, 393–413 (2016)
25. Micheletti A., Nakagawa J., Capasso V., Alessi A.A., Morale D., Villa, E.: A germ-grain model applied to the morphological study of dual phase steel. *J. Math. Ind.*, **6:12**, 1–24 (2016).
26. Camerlenghi F., Macci C., Villa E.: Asymptotic results for multivariate estimators of the mean density of random closed sets. *Electron. J. Stat.*, **10**, 2066–2096 (2016)
27. Alves A.L.M., Villa E., Rios P.R.: Transformation kinetics for nucleation on second-phase particles: Analytical solution and computer simulation. *Acta Materialia*, **131**, 523–533 (2017)
28. Camerlenghi F., Villa E.: Large and moderate deviations for kernel-type estimators of the mean density of Boolean models. *Electron. J. Stat.*, **12**, 427–460 (2018)

*In referred Conference Proceedings*

29. Micheletti, A., Patti S., Villa E.: Crystal Growth Simulations: a new Mathematical Model based on the Minkowski Sum of Sets. In: *Industry Days 2003-2004*, (D.Aquilano et al. Eds), Vol 2, The MIRIAM Project, Esculapio, Bologna, 130–140 (2005)
30. Capasso V., Villa E.: On mean geometric densities arising in inhomogeneous birth-and-growth processes. In: *Proceedings of the International Conference in Stereology, Spatial Statistics and Stochastic Geometry*, (R.Lechnerová, I.Saxl, V.Beneš, eds.), UCMP, Prague, 11–24 (2006)
31. Capasso V., Villa E.: Some remarks on the continuity of random closed sets. In: *Proceedings of the International Conference in Stereology, Spatial Statistics and Stochastic Geometry*, (R.Lechnerová, I.Saxl, V.Beneš, eds.), UCMP, Prague, 69–74 (2006)
32. Capasso, V., Villa E.: On the generalized geometric densities of random closed sets. An application to growth processes. In: *Math Everywhere Deterministic and Stochastic Modelling in Biomedicine, Economics and Industry*, (Aletti, G et al. eds), Springer, Berlin Heidelberg, 77–91 (2007)
33. Villa E.: Specific area and mean surface density of inhomogeneous Boolean models. In: *Stereology and Image Analysis. Ecs10: Proceedings of the 10th European Congress of ISS*, (V.Capasso et al. Ed.), The MIRIAM Project Series, Vol. 4, Esculapio, Bologna, 485–490 (2009)
34. Rios P.R., Assis W.L.S., Salazar T.C., Villa E.: Analytical expressions for formal kinetics. In: Proceedings of the 4th International Conference on Recrystallization and Grain Growth 2010, University of Sheffield, Sheffield. *Mater Sci Forum* **715-716**, 971–976 (2012)
35. Rios P.R., Villa E., de Oliveira S.C.: New methodology to model simultaneous and sequential reactions: main results and applications. In: Proceedings of THERMEC 2011 - International Conference on Processing & Manufacturing of Advanced Materials, Quebec, Canada. *Mater Sci Forum*, **706-709**, 149–156 (2012)
36. Rios P.R., Villa E.: Stochastic Geometry and Transformation Kinetics Theories: Basics and Results. In: TMS 2012 Annual Meeting Supplemental Proceedings: Volume 2: Materials Properties, Characterization, and Modeling (C.Wood editor); 779-785 (2012)
37. Rios P.R., Villa E.: On the generalisation of JMAK's theory. In: Proceedings of the 5th International Conference on Recrystallization and Grain Growth 2013, (M. Barnett, Ed.) Sydney, Australia. *Mater Sci Forum* **753**, 137–142 (2013)
38. Rios P.R., Villa E.: Modelling some recrystallization processes with random growth velocity of the grains. In: Progress in Industrial Mathematics at ECMI 2012 (M. Fontes et al. Ed.s), Series: Mathematics in Industry, Springer, 293–300 (2014)
39. Camerlenghi F., Capasso V., Villa E.: Numerical experiments for the estimation of mean densities of random sets. In: Proceedings of the 11th European Congress of Stereology and Image Analysis. *Image Anal. Stereol.*, **33**, 83–94 (2014)
40. Villa E.: Mean density of random closed sets and their estimation: some results and applications. In: *Recent Advances in Applied Mathematics, Modelling and Simulation - Proceedings*



of the 8th International Conference on Applied Mathematics, Simulation, Modelling '14, (N.E. Mastorakis et al. Ed.s); 84–90 (2014)

41. Micheletti A, Nakagawa J., Alessi A., Capasso V., Morale D., Villa E.: Mathematical morphology and uncertainty quantification applied to the study of dual phase steel formation. In: *Proceedings of the 1st ECCOMAS Thematic Conference on Uncertainty Quantification in Computational Sciences and Engineering*, (M. Papadrakakis et al. Ed.s) National Technical University of Athens; 714–732 (2015).
42. Micheletti A., Nakagawa J., Alessi A.A., Capasso V., Grimaldi D., Morale D., Villa E.: Mathematical morphology applied to the study of dual phase steel formation. In: *Progress in Industrial Mathematics at ECMI 2014*, (G. Russo et al. Ed.s) Springer 2016

### ***Book Chapters***

43. Capasso V., Villa E.: On the evolution equations of mean geometric densities for a class of space and time inhomogeneous stochastic birth-and-growth processes. In: *Stochastic Geometry*, (W.Weil, ed), Lecture Notes in Mathematics **1892**, CIME-subseries, Springer, Heidelberg, 267–281 (2007)
44. Rios P.R., Villa E.: Application of Stochastic Geometry to Nucleation and Growth Transformations. In: *Microstructural Design of Advanced Engineering Materials*, (D.A.Molodov, ed.) Wiley-VCH, Weinheim, 119-159 (2013)

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