

Report of the research activity I coordinated at SISSA in 2014-2017.

Alessandro Michelangeli

Page of the joint **MMQM activities**: <http://math.sissa.it/mmqm>

Currently: 4 PhD students and 2 Master students; plus, recently left:

- 1 PhD student (Domenico Monaco, PhD in 2014, then research associate in Tuebingen and Rome3),
- 1 Master student (Andrea Ottolini, MSc in 2016, now PhD student in Stanford),
- -2 post-doc (Gustavo De Oliveira, left in 2016, now assistant professor in Mina Gerais; Marco Erceg, left in 2017, now assistant professor in Zagreb)

research lines 2014-2017: <http://math.sissa.it/mmqm>

146 visitors in 2014-2017:
<http://www.sissa.it/~alemiche/>

129 seminars in 2014-2017:
<https://math.sissa.it/content/>

10 courses taught by us in 2014-2017:

- **Michelangeli 2017**: <http://www.math.sissa.it/>
- **Michelangeli 2016/2017**: <http://www.math.sissa.it/>
- **Yajima 2016**: <http://www.math.sissa.it/>
- **Pickl 2016**: <http://www.math.sissa.it/>
- **De Oliveira 2016**: <http://www.math.sissa.it/>
- **Dell'Antonio 2016**: <http://www.math.sissa.it/>
- **Michelangeli 2015/2016**: <http://www.math.sissa.it/>
- **Michelangeli 2015**: <http://www.math.sissa.it/>
- **Dell'Antonio 2015**: <http://www.math.sissa.it/>
- **Dell'Antonio 2014**: <http://www.math.sissa.it/>

37 publications and pre-prints in 2014-2017 (in **red**: the co-authors belonging to the MMQM group):

1. **A. Michelangeli, A. Olgiati, R. R. Scandone**, The singular Hartree equation in fractional perturbed Sobolev spaces, arXiv:1711.04418 (2017)
2. **M. Gallone, A. Michelangeli**, Discrete spectra for critical Dirac-Coulomb Hamiltonians, arXiv:1710.11389 (2017)
3. **M. Gallone, A. Michelangeli**, Self-adjoint realisations of the Dirac-Coulomb Hamiltonian for heavy nuclei, arXiv:1709.02732 (2017)
4. **M. Erceg, A. Michelangeli**, On contact interactions realised as Friedrichs systems, SISSA preprint 48/2017/MATE (2017)
5. P. Antonelli, **A. Michelangeli, R. Scandone**, Global, finite energy, weak solutions for the NLS with rough, time-dependent magnetic potentials, arXiv:1706.00700 (2017)

6. N. Antonic, **M. Erceg**, **A. Michelangeli**, Hilbert space approach to Friedrichs systems, *J. Differential Equations* 263 (2017), no. 12, 8264–8294
7. F. Iandoli, **R. Scandone**. Dispersive estimates for Schrödinger operators with point interactions in \mathbb{R}^3 . In *Advances in Quantum Mechanics: Contemporary Trends and Open Problems*, A. Michelangeli and G. Dell'Antonio, eds., Springer INdAM Series, vol. 18, Springer International Publishing, pp. 187–199 (2017)
8. **M. Gallone**. Self-adjoint extensions of Dirac-Coulomb operator. In *Advances in Quantum Mechanics*, G. Dell'Antonio and A. Michelangeli, eds., vol. 18 of INdAM-Springer series, Springer International Publishing. pp. 169-185 (2017)
9. **G. Dell'Antonio**, **A. Michelangeli**, **R. Scandone**, **K. Yajima**, The L^p -boundedness of wave operators for the three-dimensional multi-centre point interaction, arXiv:1704.04263 (2017), in press on *Ann. Henri Poincaré*
10. **A. Olgiati**, Remarks on the derivation of Gross-Pitaevskii equation with magnetic Laplacian, in *Advances in Quantum Mechanics: Contemporary Trends and Open Problems*, G. Dell'Antonio and A. Michelangeli, eds., Springer INdAM Series vol. 18, Springer International Publishing, 2017, pp. 257–266.
11. **A. Olgiati**, Effective Non-linear Dynamics of Binary Condensates and Open Problems, in *Advances in Quantum Mechanics: Contemporary Trends and Open Problems*, G. Dell'Antonio and A. Michelangeli, eds., Springer INdAM Series vol. 18, Springer International Publishing, 2017, pp. 239–256.
12. **G. Dell'Antonio**, **A. Michelangeli**. *Advances in Quantum Mechanics: Contemporary Trends and Open Problems*. INdAM-Springer Series vol. 18.
13. **A. Michelangeli**, **A. Olgiati**, Mean-field quantum dynamics for a mixture of Bose-Einstein condensates, *Anal. Math. Phys.* 7 (2017), 4:377-416
14. V. Georgiev, **A. Michelangeli**, **R. Scandone**, On fractional powers of singular perturbations of the Laplacian, arXiv:1710.05870 (2017)
15. **A. Michelangeli**, **A. Olgiati**, Gross-Pitaevskii non-linear dynamics for pseudo-spinor condensates, *J. Nonlin. Math. Phys.* (2017), 24(3) 426-464
16. N. Antonic, K. Burazin, I. Crnjac, **M. Erceg**. Complex Friedrichs systems and applications. *Journal Math. Phys.* 58, 101508 (2017)
17. **A. Michelangeli**, **A. Ottolini**, On point interactions realised as Ter-Martirosyan-Skornyakov operators, *Reports Math. Phys.* (2017) 79(2) 215-260
18. S. Lakaev, **G. Dell'Antonio**, A. Khalkhuzhaev. Existence of an isolated band in a system of three particles in an optical lattice. *J. Phys. A* 49, no. 14, 145204, 15 pp. 82D05 (2016)
19. **A. Michelangeli**, **A. Ottolini**, Multiplicity of self-adjoint realisations of the (2+1)-fermionic model of Ter-Martirosyan–Skornyakov type, SISSA preprint 65/2016/MATE (2016), in press on *Reports Math. Phys.*
20. B. Hetenyi, **A. Michelangeli**, Superfluidity via centre-of-mass reduced density and Drude weights, SISSA preprint 19/2016/MATE
21. **G. Dell'Antonio**. Lectures on the mathematics of quantum mechanics. II. Selected topics. *Atlantis Studies in Mathematical Physics: Theory and Applications*, 2. Atlantis Press (2016)
22. **A. Michelangeli**, G. Pitton, Non-linear Schrödinger system for the dynamics of a binary condensate: theory and 2D numerics, SISSA preprint 63/2016/MATE (2016)
23. **G. Dell'Antonio**. Measurements vs. interactions: tracks in a Wilson cloud chamber. *Noncommutative analysis, operator theory and applications*, 171–180, *Oper. Theory Adv. Appl.*, 252, Linear Oper. Linear Syst., Birkhäuser/Springer (2016)
24. Michele Correggi, **Daniele Dimonte**. On the third critical speed for rotating Bose-Einstein condensates. *Journal of Mathematical Physics* 57 (7), 071901 (2016)
25. D. Fiorenza, **D. Monaco**, G. Panati. \mathbb{Z}_2 invariants of topological insulators as geometric obstructions. *Commun. Math. Phys.* 343, Issue 3 (2016), 1115-1157.
26. **A. Michelangeli**, **D. Monaco**. Stability of closed gaps for the alternating Kronig-Penney Hamiltonian. *Anal. Math. Phys.* 6, Issue 1 (2016), 67-83.
27. **G. Dell'Antonio**, **A. Michelangeli**. Schrödinger operators on half line with shrinking potentials at the origin, *Asymptotic Analysis* 97 (2016) 113-138
28. D. Fiorenza, **D. Monaco**, G. Panati. Construction of real-valued localized composite Wannier functions for insulators. *Ann. Henri Poincaré* 17, Issue 1 (2016), 63-97.

29. **A. Michelangeli**, P. Pfeiffer. Stability of the (2+2)-fermionic system with zero-range interaction, *J. Phys. A: Math. Theor.* 49 (2016) 105301
30. **G. Dell'Antonio**. On tracks in a cloud chamber. *Found. Phys.* 45 (2015), no. 1, 11–21
31. **G. Dell'Antonio**. Lectures on the mathematics of quantum mechanics. I. *Atlantis Studies in Mathematical Physics: Theory and Applications*, 1. Atlantis Press, Paris, (2015)
32. M. Correggi, **G. Dell'Antonio**, D. Finco, **A. Michelangeli**, A. Teta. A Class of Hamiltonians for a Three-Particle Fermionic System at Unitarity, *Mathematical Physics, Analysis and Geometry*, 18(1), 1-36 (2015) 13.
33. **A. Michelangeli**, Global well-posedness of the magnetic Hartree equation with non-Strichartz external fields, *Nonlinearity* 28 (2015) 2743-2765 12.
34. **D. Monaco**, G. Panati. Symmetry and localization in periodic crystals: triviality of Bloch bundles with a fermionic time-reversal symmetry. Proceedings of "Symmetry and Perturbation Theory 2014", May 25 - June 1, 2014, Cala Gonone (Italy). *Acta App. Math.* 137, Issue 1 (2015), 185-203.
35. **G. Dell'Antonio**, **A. Michelangeli**. Dynamics on a graph as the limit of the dynamics on a "fat graph", in *Mathematical Technology of Networks*, D. Mugnolo ed., Springer Proc. in Mathematics & Statistics 128 (2015), 49-64
36. **G. De Oliveira**. Quantum dynamics of a particle constrained to lie on a surface. *Journal of Mathematical Physics* 55, 092106 (2014)
37. **D. Monaco**, G. Panati. Topological invariants of eigenvalue intersections and decrease of Wannier functions in graphene. *J. Stat. Phys.* 155, Issue 6 (2014), 1027-1071.

12 workshops/conferences in 2014-2017 (+ scheduled organised events in 2018) organised or co-organised by SISSA members of the MMQM joint activities:

1. Workshop "[Mathematical Challenges of Zero-Range Physics: rigorous results and open problems](#)", Rome, 9-13 July 2018
2. School and workshop "[Mathematical challenges in quantum mechanics](#)", Rome, 19-24 February 2018
3. Conference "[Trails in Quantum Mechanics and Surroundings](#)", SISSA Trieste, 29-30 January 2018
4. Junior Symposium "[The Junior Trieste Quantum Days 2017](#)"; SISSA, Trieste 12 and 19 May 2017
5. Conference "[Trieste Quantum Days 2017](#)", SISSA, Trieste 20-24 February 2017
6. Workshop "[Mathematical Challenges of Zero-Range Physics: rigorous results and open problems](#)", SISSA, 7-10 November 2016
7. Workshop "[Contemporary trends in the mathematics of Quantum Mechanics](#)", Rome, 4-8 July 2016
8. Workshop "[Trieste Quantum Days: solid, stat, et al.](#)", SISSA, Trieste, 21-23 June 2016
9. School and workshop "[Mathematical challenges in quantum mechanics](#)", Bressanone, 8-13 February 2016
10. Conference "[Selected Problems in Mathematical Physics, Statistical Mechanics, Many-Body Quantum Physics and PDEs](#)", La Spezia, 1-5 September 2014
11. Conference "[Solid Math](#)", SISSA Trieste, 16-19 June 2014
12. Workshop "[Mathematical Challenges of zero-range Physics](#)", CAS-LMU Munich, 26-28 February 2014
