

## Curriculum Vita

Mei-Chu Chang

Department of Mathematics, University of California, Riverside, CA 92521

Ph.D. University of California-Berkeley 1982

### Employment:

University of California, Riverside, Professor, 1991-present

University of California, Riverside, Associate Professor, 1987-1991

University of South Carolina, Assistant Professor, 1984-1987

University of Michigan, Assistant Professor, 1984-1986

California Institute of Technology, Bateman Research Instructor, 1982-1984

### Visiting Positions:

Mathematical Sciences Research Institute, Research Professor, Spring 2014

Korea Institute for Advanced Study, Seoul, Visiting Professor, 3/2001

Institute for Advanced Study, Princeton, Member, 1995-1996

IHES, France, Visiting Professor, Summers 1991-1995

University of Rome, Italy, CNR Professor, 4/1988-5/1988

University of Naples, Italy, CNR Professor, 5/1988-6/1988

University of California, Los Angeles, U.C. President's Fellow, 1987-1989

Mittag-Leffler Institute, Sweden, Visiting Professor, 4/1987-7/1987

### Scientific/Academic Honors:

2017 Fellow of the American Mathematical Society

2016-2018 National Science Foundation research grant DMS-1600154

2013-2016 National Science Foundation research grant DMS-1301608

2010-2013 National Science Foundation research grant DMS-1000507

### Invited Addresses:

Additive Combinatorics and Applications, CMSA at Harvard University, 2017

Emerging Leaders and Evolving Frontiers in Analytic Number Theory, Hausdorff Center, Bonn, 2014

New Horizons in Additive Combinatorics, CRM, Montreal, 2014

Additive and Analytic Combinatorics, IMA, Minnesota, 2014

Model Theory research seminar, MSRI, Berkeley, 5/2014

Model Theory and Its Interactions with Number Theory and Arithmetic Geometry, MSRI, Berkeley, 2/2014

The First/Third/Sixth International Congress of Chinese Mathematicians, Peking/Hong Kong /Taipei, 1998/2004/2013, (45 minutes each)

The Art of Iterating Rational Functions over Finite Fields, Banff, Canada, 2013

Analytic Methods in Diophantine Equations Conference, Goettingen University, 2012

Hong Kong Univ of Science and Technology-Institute for Advanced Study Distinguished Lectures Series, 2010

Szemerédi 70 conference, Alfréd Rényi Institute of Mathematics, Budapest, 2010

Workshop on Graphs and Arithmetic, Centre de recherches mathematiques. Montreal, 2010  
 The 9th International Conference on Finite Fields and Applications, Dublin, 2009, (50 minutes, plenary)

Discrete Rigidity Phenomena in Additive Combinatorics, MSRI, Berkeley, 2008

Additive Combinatorics, Number Theory and Harmonic Analysis, Fields Institute, Toronto, 2008

School and Workshop on Additive Combinatorics, Montreal, 2006

AMS Sectional Meeting, Santa Barbara, 2005, (an hour, plenary)

Recent Trends in Additive Combinatorics. American Institute for Math., Palo Alto, 2004

Workshops on Combinatorial and Additive Number Theory, Graduate Center, CUNY, New York, 05/2000-2015

UCB/UCSB Algebra Day, Berkeley, 06/2015

Algebra/Number Theory/Combinatorics Seminar, Claremont Center for Mathematics, Claremont, 2010, 2013

Michigan State Joint Number Theory Seminar, Ann Arbor, 2005

Number Theory Seminar. Montreal, 2004

Caltech-UCLA Joint Analysis Seminar, 2004, 2013

Caltech Combinatorics Seminar, 06/2016

Joint Number Theory and Analysis Seminar. Caltech, 2004

### Conferences Organized:

CIRM Dynamics and Graphs over Finite Fields: Algebraic, Number Theoretic and Algorithmic Aspects, Luminy, 04/2016 (co-organized with Gathen, Pappalardi and Ostafe)

AMS Special Session on Combinatorial Number Theory, UCR, 11/2009 (with Gamburd)

Algebraic Geometry and Commutative Algebra Conference, UIC, 2008 (with Ein, Nollet, Ulrich)

AMS Special Session on Combinatorial Number Theory, UCSB, 04/2005 (coorganized with Vu)

### Synergistic Activities:

*Content Review Panel for California Standards Test in Math, grades K-12, 1999-2013\**

\* (California adopted Common Core State Standards in 2013.)

*Faculty for UC President's Postdoctoral Fellowship Program. (2000-present)*

*Member of Faculty Advisory Committee for UC President's Postdoctoral Fellowship. (2013-present)*

The program was established to encourage outstanding underrepresented Ph.D. recipients to pursue academic career at UC.

### Publications:

1. Stable rank 2 bundles on  $\mathbb{P}^3$  with  $c_1 = 0, c_2 = 4$ , and  $\alpha = 1$ . *Math Z.* **184** (1983), 407-415.
2. A Bound on the order of jumping lines. *Math. Ann.* **262** (1983), 511-516.
3. Stable rank 2 reflexive sheaves on  $\mathbb{P}^3$  with large  $c_3$ . *J. Reine Angew. Math.* **343** (1983), 99-107.
4. Stable rank 2 reflexive sheaves on  $\mathbb{P}^3$  with small  $c_2$  and applications. *Trans. Amer. Math. Soc.* **284** (1984), 57-89.

5. Unirationality of the moduli spaces of curves of genus 11, 13 (and 12), with Z. Ran. *Invent. Math.* **76** (1984), 41-54.
6. Closed families of smooth space curves, with Z. Ran. *Duke Math. J.* **52** (1985), 707-713.
7. Deformations and smoothing of complete linear systems on reducible curves, with Z. Ran. *Algebraic Geometry, Bowdoin, 1985*, 63-75, *Proc. Sympos. Pure Math.* **46**.
8. Postulation of canonical curves in  $\mathbb{P}^3$ . *Math. Ann.* **274** (1986), 27-30.
9. The Kodaira dimension of the moduli space of curves of genus 15, with Z. Ran. *J. Differential Geom.* **24** (1986), 205-220.
10. A Note on the slope of subvarieties of  $M_{15}$ , with Z. Ran. *Mathematical aspects of string theory (San Diego, 1986)*, 408-411, World Sci. Publishing, 1987.
11. Divisors on  $M_g$  and the cosmological constant, with Z. Ran. *Mathematical aspects of string theory (San Diego, 1986)*, 386-393, World Sci. Publishing, 1987.
12. Some good unirational families of space curves. *Ark. Mat.* **26** (1988), 55-65.
13. Buchsbaum subvarieties of codimension 2 in  $\mathbb{P}^n$ . *Bull. Amer. Math. Soc.* **19** (1988), 269-272.
14. A filtered Bertini-type theorem. *J. Reine Angew. Math.* **397** (1989), 214-219.
15. Classification of Buchsbaum Subvarieties of codimension 2 in projective space. *J. Reine Angew. Math.* **401** (1989), 101-112.
16. Characterization of arithmetically Buchsbaum subschemes of codimension 2 in  $\mathbb{P}^n$ . *J. Differential Geom.* **31** (1990), 323-341.
17. On the slope and Kodaira dimension of  $M_g$  for small  $g$ , with Z. Ran. *J. Differential Geom.* **34** (1991), 267-274.
18. On the hyperplane sections of certain codimension 2 subvarieties in  $\mathbb{P}^n$ . *Arch. Math.* **58** (1992), 547-550.
19. Some obstructed manifolds with very ample canonical bundle. *J. Algebraic Geom.* **1** (1992), 1-4.
20. Divisors on some generic hypersurfaces, with Z. Ran. *J. Differential Geom.* **38** (1993), 671-678.
21. On the zero sets of vector bundles. *Chinese J Math.* **21** (1993), 109-114.
22. The slopes of surfaces in  $\mathbb{P}^4$  and rational expressions in Newton functions. *Internat. Math. Res. Notices* 1994, 19-21.
23. Dimension of families of space curves, with Z. Ran. *Composito Math.* **90** (1994), 53-57.
24. On the Chern numbers of surfaces and 3-folds of codimension 2. *Tokyo J. Math.* **19** (1996), 368-386.
25. The number of components of Hilbert schemes. *Internat J. Math.* **7** (1996), 301-306.
26. Distributions of Chern numbers of complete intersection three-folds. *Geom. Funct. Anal.* **7** (1997), 861-872.
27. Appendix to 'On the Geography of Threefolds by X. Liu'. *Tohoku Math. J.* **49** (1997), 69-71.
28. Inequidimensionality of Hilbert schemes. *Proc. Amer. Math. Soc.* **125** (1997), 2521-2526.
29. Bounds on  $c_3$  for threefolds, with H. Kim and S. Nollet. *Manuscripta Math.* **97** (1998), 135-141.

30. On the density of ratios of Chern numbers of embedded threefolds. *Comm. Algebra* **27** (1999), 3771-3776.
31. The Euler number of certain primitive Calabi-Yau threefolds, with H. Kim. *Math. Proc. Cambridge Philos. Soc.* **128** (2000), 79-86.
32. Some remarks on Buchsbaum bundles. *J. Pure Appl. Algebra* **152** (2000), 49-55.
33. Some combinatorics of binomial coefficients and the Bloch-Gieseker property for some homogeneous bundles. *Trans. Amer. Math. Soc* **254** (2002), 975-992.
34. A linear bound on the Euler number of 3-Folds of Calabi-Yau and of general type, with A. Lopez. *Manuscripta Math.* **105** (2001), 47-69.
35. On the Euler numbers of threefolds in First international congress of Chinese mathematics. *Amer. Math. Soc.* 229-234, (2001).
36. A polynomial bound in Freiman's theorem. *Duke Math. J.* **113** (2002), 399-419.
37. On the size of  $k$ -fold sum and product sets of integers, with J. Bourgain. *J. Amer. Math. Soc.* **17** (2004), 473-497.
38. On multiple sum and product sets of finite Ssts of integers, with J. Bourgain. *C. R. Math. Acad. Sci* **337** (2003), 499-503.
39. Factorization in generalized arithmetic progressions and application to the Erdős-Szemerédi sum-product problems. *Geom. Funct. Anal.* **13** (2003), 720-736.
40. The Erdős-Szemerédi problem on sum set and product set. *Ann. of Math.* **157** (2003), 939-957.
41. New results on the Erdős-Szemerédi sum-product problems. *C. R. Math. Acad. Sci.* **336** (2003), 201-205.
42. On problems of Erdős and Rudin. *J. Funct. Anal.* **207** (2004), 444-460.
43. On sums and products of distinct numbers. *J. Combin. Theory Ser. A* **105** (2004), 349-354.
44. Sum-product theorem and exponential sum estimates in residue classes with modulus involving few prime factors, with J. Bourgain. *C. R. Math. Acad. Sci* **339** (2004), 463-466.
45. A sum-product theorem in semi-simple commutative Banach algebras. *J. Funct. Anal.* **212** (2004), 399-430.
46. A sum-product estimate in algebraic division algebras over  $\mathbb{R}$ . *Israel J. Math.* **150** (2005), 369-380.
47. A Gauss sum estimate in arbitrary finite fields, with J. Bourgain. *C. R. Math. Acad. Sci* **342** (2006), 643-646.
48. Exponential sum estimates over subgroups and almost subgroups of  $\mathbb{Z}_q$ , where  $q$  is composite with few prime factors, with J. Bourgain. *Geom. Funct. Anal.* **16** (2006), 327-366.
49. On sum-product representations in  $\mathbb{Z}_q$ . *J. of Eur. Math. Soc.* **8** (2006), 435-463.
50. Sum and product of different sets. *Contrib. Discrete Math.* **1** (2006) 47-56.
51. On a problem of Arnold on uniform distribution. *J. Funct. Anal.* **242** (2007), 272-280.
52. Additive and multiplicative structure in matrix spaces. *Combin. Probab. Comput.* **16** (2007), 219-238.
53. On the minimum norm of representatives of residue classes in number fields, with J. Bourgain. *Duke Math. J.* **138** (2007), 263-280.

54. Sum-product theorems and incidence geometry, with J. Solymosi. *J. Eur. Math. Soc.* **9** (2007), 545-560.
55. Convolution of discrete measures on linear groups. *J. Funct. Anal.* **253** (2007), 303-323.
56. Product theorems in  $SL_2$  and  $SL_3$ . *J. Inst. Math. Jussieu.* **7** (2008), 1-25.
57. An explicit bound on double exponential sums related to Diffie-Hellman distributions, with C. Yao. *SIAM J. Discrete Math.* **22** (2008), 348-359.
58. Some problems in combinatorial number theory. *Integers* **8** (2008), 11pp.
59. On a question of Davenport and Lewis and new character Sum bounds in finite fields. *Duke Math J.* **145** (2008), 409-442.
60. Set addition and set multiplication in Third international congress of Chinese mathematicians, Part 1, 2. *AMS/IP Stud. Adv. Math.* **42** (2008), pt. 1, 2, 707-719.
61. Some problems related to sum-product theorems. *Center de Recherches Mathematiques Proceedings and Lecture Notes*, no. 43, 235-240, (2008).
62. Character sums in finite fields. *AMS Contemporary Mathematics.* 83-98, (2010).
63. On character sums of binary quadratic forms. *J. Number Theory* **129** (2009), 2064-2071.
64. Burgess inequality in  $\mathbb{F}_p^2$ . *Geom. Funct. Anal.* **19** (2009), 1001-1016.
65. Sum-product theorems in algebraic number fields, with J. Bourgain. *J. Anal. Math.* **109** (2009), 253-277.
66. Some consequences of the polynomial Freiman-Ruzsa Conjecture. *C. R. Math. Acad. Sci* **347** (2009), 583-588.
67. Explicit sum-product theorems for large subsets of  $\mathbb{F}_p$ . *Combinatorica* **29** (2009), 629-635.
68. On a multilinear character sum of Burgess, with J. Bourgain. *C. R. Math. Acad. Sci.* **348** (2010), 115-120.
69. An estimate of incomplete mixed character sums in An irregular mind, 243-250, *Bolyai Soc. Math. Stud.* **21** Budapest, 2010.
70. On product sets in  $SL_2$  and  $SL_3$  in Additive Number Theory. Editors: D. Chudnovsky, G. Chudnovsky. Springer, 3p, (2010).
71. Partial quotients and distribution of sequences. *C. R. Math. Acad. Sci.* **349** (2011), 713-718.
72. Short character sums with Fermat quotients. *Acta Arith.* **152** (2012), 23-38.
73. Expansions of quadratic maps in prime fields. *Proc. Amer. Math. Soc.* **142** (2014), 85-92.
74. Polynomial iteration in characteristic  $p$ . *J. Funct. Anal.* **263** (2012), 3412-3421.
75. Elements of large order in prime finite fields. *Bull. Aust. Math. Soc.* **88** (2013), 169-176.
76. Order of Gauss periods in large characteristic. *Taiwanese J. Math.* **17** (2013), 621-628.
77. Short character sums for composite moduli. *J. Anal. Math.* **123** (2014), 1-33.
78. On a matrix product question in cryptography. *Linear Algebra Appl.* **439** (2013), 1742-1748.
79. Points on curves in small boxes and applications. with J. Cilleruelo, M. Garaev, J. Hernandez, I. Shparlinski, A. Zumalacarregui, *Michigan Math. J.* **63** (2014), 503-534.
80. Elements of large order on varieties over prime finite fields, with B. Kerr, I. Shparlinski, U. Zannier. *J. Théor. Nombres Bordeaux*, **26** (2014), 579 - 593.

81. New estimates on incomplete character sums in Sixth international congress of Chinese mathematicians, AMS/IP Sud. Adv. Math.
82. Sparsity of the intersection of polynomial images of an interval. *Acta Arith.* **165** (2014), 243-249.
83. Double character sums over subgroups and intervals, with I. Shparlinski. *Bull. Aust. Math. Soc.* **90** (2014), 376-390.
84. On periods modulo  $p$  in arithmetic dynamics, *C. R. Math. Acad. Sci* **353** (2015), 283-285.
85. On the density of integer points on generalised Markoff-Hurwitz hypersurfaces, with I. Shparlinski, *Math. Z.* (to appear).
86. A Remark on sieving in biased coin convolutions, *SIAM J. Discrete Math.* (to appear).
87. On a paper of Erdős and Szekeres, with J. Bourgain, *J. Anal. Math.* (to appear).
88. Character Sums and Arithmetic Combinatorics, in *Recent Trends in Combinatorics (The IMA Volumes in Mathematics and its applications)*. Editors: Beveridge, Griggs, Hogben, Musiker, Tetali. Springer, **159**, 2015.
89. Arithmetic progressions in multiplicative groups of finite fields, *Israel J. Math.* (to appear).
90. Multiplicative energy of polynomial images of intervals modulo  $q$ , with K. Castro, (preprint).
91. Simultaneously preperiodic points for families of polynomials in normal form, with C. D'Andrea, A. Ostafe, I. E. Shparlinski, and M. Sombra, *Proc. Amer. Math. Soc.* (to appear).
92. Nonlinear Roth type theorems in finite fields, with J. Bourgain, *Israel J. Math.* (to appear).
93. Random eigenfunctions on flat tori: universality for the number of intersections, (with H. Nguyen, O. Nguyen, and V. Vu), (preprint).
94. On the exponential large sieve inequality for sparse sequences modulo primes, with B. Kerr, I. Shparlinski, *J Math Anal Appl* (to appear)

preprints are available on <http://math.ucr.edu/mcc/paper/>