Résumé April 8, 2019

Professor Gautam Dasgupta, Columbia University, New York, NY
dasgupta@columbia.edu; DOB: October 13, 1946; Citizenship: USA

Education

Bengal Engineering College, Calcutta University, INDIA: Bachelor of Engineering 1967 (Civil) Master of Engineering 1969 (Applied Mechanics)
University of California, Berkeley, Doctor of Philosophy 1974 (Structural Mechanics)

Employment

Columbia University, Asst. Prof. 1978, Assoc. Prof. 1981, Prof. 1994
University of California, Berkeley, Post-doctoral fellow 1974–77
Goa Polytechnic, Lecturer, Applied Mechanics, 1970
Technical Teachers Trainee, Applied Mechanics, 1967–70

Guest Professorship

Technische Universität, Wien, Austria, 1982-92, Associate Professor
Bundeswahr Universitat, Hamburg, Germany, 1986-87, Associate Professor
Technische Universitat, Braunschweig, Germany, 1993-94, Professor

Fellowship

Alexander von Humboldt Stiftung, Germany, 1986
Fulbright Senior Professorship, Washington D.C., 1998
Tsunoda Research Fellowship, Waseda University, Japan, 2017

Cumulative Research Funding

National Science Foundation: $1,187,000;
National Institutes of Health: $300,000
Columbia University Academic Quality Fund $270,000

Publication

Textbook: 1 (Springer Verlag); Journal Papers: 16 (single author), 21 (joint);

Columbia University Patent

U.S. Patent No. 6,101,450: "Stress Analysis ... Defect-Free ... Finite Element Technique"

Consulting Experience

Bechtel Corporation, San Francisco, California, 1974-77
Weidlinger Associates, New York, NY, 1977–80
AMOCO, Tulsa, OK, 1983–87
NASA-Lewis, Probabilistic structural analysis, 1981-86
Business Advantage, Espoo, Finland, Computer Algebra, 1991-
Knowledge Solutions Group, Toyo, Japan, 1999–

Conference Chair

Founding Chair: International Mathematica Symposium, 1995
Vice Chair: Turing Centenary Advisory Committee, 2013

Committee Chair and Editorship

American Society of Civil Engineers, Journal of Engineering Mechanics:
Elasticity, 1980 1985; Bioengineering, 1990 1995

Teaching

Continuum Mechanics (Current); Structural Mechanics and Applied Mathematics

Activities from 1/1/2018–1/20/2019[†] Prepared on: April 8, 2019

Professor Gautam Dasgupta, dasgupta@columbia.edu

with Waseda University

Columbia University Tsunoda Fellowship: Engineering Mechanics in Waseda

Research with Senior and Junior faculty members: Large scale symbolic computations

with NYU and Tsinghua University

Project: Turing, Chomsky and Wolfram in "Computational Thinking"

with Tsinghua University and Knowledgw Solutions Group, Tokyo

Project: Large Scale Optimization with Symbolic Computation

with Osaka University, Osaka

Guest speaker at the December 2018 "Disaster Mitigation" symposium

with Advanced Institute of Industrial Technology (AIIT), Tokyo

Guest speaker at the September 2018 "Disaster Mitigation" symposium

Tokyo Metropolitan University Public University Corporation, Asia Professional Educational Netwrok, November 2018 meeting, Kuwala Lumpur:
'Statistics of Extremes for Natural, Industrial and Man-made Extreme Disasters'

with Universities and Institutes in India

Birla Institute of Technology and Science, Pilani — Goa:
Guest Lecture on Computations in Engineering Mechanics

Indian Statistical Institute, Kolkata
Languages for Symbolic Computations

Indian Institute of Engineering Science and Technology, Shibpur
Emergency Management and Security Engineering

with Springer Verlag

Completing: Tensor Computations: *for* Physical, Cyber & Uncertain Systems

Mid stage of writing: SecurityEngineering:
Mitigating Natural, Industrial & Man-made Extreme Disasters

Final Stage of Editing: "Complex Fibonacci Series with Applications" —by A. Weierholt

Final Stage of Editing: "Computer Metalanguage with Applications" —by B. Koo

with ASCE Elasticity Committee

Committee Member: Reviewer;

Special Lectue at the Tokyo Institute of Technology, O-okayama, Meguro-ku Tokyo:
"Analytical Computation of Exact Strains in Quadrilaterals"

Current Paper: "Large Strain Computation in Quadrilaterals"

Commencement Speaker at AIT, Bangkok

Chief Guest for May 2018 graduation ceremony; Guest Speaker at the Commencement

Hosting Scholars

J. Shen, PhD student, Tsinghua University, Beijing

A. Weierholt, Prof. Mathematics, Oslo Engineering College, Oslo

Three Journal Publications with students in University of Science and Technology Beijing

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[†] *Research items are fully funded by host institutes to the collaborators.* On medical leave in Spring 2019.

Teaching
Spring 2017: E8310 (Elasticity) and E4214 (Plates and Shells)
Fall 2018: E8320 (Inelasticity) and E4005 (Computer Graphics)

Original Derivation: Theorems & Algorithms April 8, 2019

Professor Gautam Dasgupta, dasgupta@columbia.edu

Elasticity and viscoelasticity

Derived an integral representation for viscoelastic harmonic respones from the elastic counterpart: accelerated conventional methods.

Extended Almansi's isotropic elasticity theorem for conditional solution to anisotropy. For example, the boundary element method can be solved when the stresses and displacements were simultaneously prescribed on a boundary subset.

Statistics of Extremes

Proved that the extreme distribution of type-2, Fréchet distribution, is the unique probabilistic description to model terrorism. Training exercises of the first responders can be simulated using different thresholds.

Finite Elements

Substructure deletion:

Cloning algorithm:

Analytical formulations for incompressibility:

Stochastic finite element with stochastic shape functions:

Boundary Elements

Stochastic boundary element with stochastic Green's functions:

Computer Mathematics

Simultaneous sensitivity evaluation in symbolic computation:

Exact integration within polygons:

Exact integration — Extensions to $\Re^n$*:*

Barycentric Coordinates

Weights for Wachspress coordinates:

Long Term Collaboration April 8, 2019

Professor Gautam Dasgupta, dasgupta@columbia.edu

Emertus Researchers

J. J. Connor, Emertus Prof. Civil Engineering, MIT, USA Mathematical modeling

E. L. Wachspress, Emertus Prof., U. Calif. : Barycentric coordinates

B. Buchberger, Emeritus Director, RISC, Johannes Kepler University, Schloss Hagenberg, Austria: Computer Mathematics

E. Tachibana, Emeritus Dean of Engineering, Osaka University, Japan: Supercomputing, Structural Dynamics and Disaster Mitigation

G. Leitman, Emertus Prof., U. Calif. Berkeley: Optimization

Sir F. Thackeray, Emertus Director, Transvaal Museum, Pretoria, South Africa: Morphometric Anthropology

Dr. J. Treil, Chevalier dans l'Ordre National de la Lgion d'Honneur, Emeritus Clinique Pasteur, Toulouse, France Cranio-facial Growth Analysis

R. Dougherty, Emertus Professor, NYU: Computer Mathematics

Researchers with Current Projects

L. Moss-Salentijn, Associate Dean, Columbia College of Dentisry: Morphometry

S. Kawata, President, Advance Industrial Institute of Technology, Tokyo

K. Sutner, Dean of studies, Computer Science, Carnegie-Mellon: Computer Mathematics

S. Kundu, Tokyo Metropolitan University, Tokyo: Numerical Simulation with Genetic Algorithm and Cellular Automata

Dr. Masao Arakawa, Kagawa University, Takamatsu Fuzzy Logic

Dr. V. Keränen, University of Applied Sciences, Rovaniemi, Finland Generation of extreme samples by Abelian square-free combinatorics on words

Dr. T. Gharbi, Université de Franche-Comté, Besançon, France Intelligent Optical Device and Sensing Equipment

Dr. P. Fritzson, Programming Environments Laboratory, Linkping Universitet, Sweden Mathematical Modeling and Symbolic Computation

J. Treil, Chevalier dans lOrdre National de la Lgion dHonneur, Emeritus Clinique Pasteur, Toulouse, France Cranio-facial Growth Analysis

J. Braga, Universit Paul Sabatier, Toulouse Anthropobiology and Morphology

B. Koo, Tsinghua University, Tensor Flow Computations

A. Weierholt, Professor, Oslo Engineering College, Norway: Complex Fibonacci Series

D. Laefer, Prof. NYU: Geotechnical Engineering

P. Jain, Prof. Mathematics, R.D.University Jabalpur, India: Barycentric Coordinates

Past Students

M. Prados-Privados, Assistant Professors

Qingwen Li, Associate Professor, University of Science and Technology Beijing, China: Geotechnical Engineering

R. Keles, Professor, CUNY: Fluid Mechanics

Distinguished Mentors till 2015

J. F. Nash, Princeton University: Game Theory in Disaster Mitigation

L. A. Zadeh, U. C. Berkeley: Fuzzy Logic in Disaster Mitigation

Archived Journal Papers and Book sections

Single authored

1. A numerical solution for viscoelastic half planes, *Journal of the Engineering Mechanics Division,* American Society of Civil Engineers, New York, NY, vol. 102, no. EM4, August 1976, pp. 601 – 612.
2. Foundation impedance matrices by substructure deletion, *Journal of the Engineering Mechanics Division,* American Society of Civil Engineers, New York, NY, vol. 106, no. EM3, June 1980, pp. 517 – 523.
3. Viscoelastic responses of finite bodies by Quadrature form of correspondence principle, *Journal of Applied Mechanics,* ASME, New York, NY, vol. 48, March 1981, pp. 206 – 207.
4. A finite element formulation for unbounded homogeneous continua, *Journal of Applied Mechanics,* ASME, New York, NY, vol. 104, March 1982, pp. 136 – 140.
5. Computation of exterior potential fields by infinite substructuring, *Computer Methods in Applied Mechanics and Engineering,* Elsevier Science (North-Holland), vol. 46, 1984, pp. 295 – 305.
6. Evaluation of added mass by a cloning algorithm, *International Journal of Numerical Methods in Engineering,* vol. 21, 1985, pp. 1157–1164.
7. Validity of Almansi theorems for anisotropic boundary elements, *International Journal of Engineering Analysis,* Computational mechanics Publication, (CMPL) Ashurst, UK, vol. 5, no. 2, 1988, pp. 89–94.
8. Boundary elements with Mathematica, *International Journal of Software Engineering,* CMPL, vol. 6, no. 1, January 1990, pp. 1–10.
9. Boundary Modulation, *International Journal of Software Engineering, Advances in Boundary Elements,* CMPL, vol. 9, 1992, pp. 247–253.
10. Approximate dynamic responses in random media, *Acta Mechanica*, Springer Verlag, 1992, vol.3, pp. 99-114.
11. G. Dasgupta, Stochastic Constitutive Modeling for Electrorheological Media, *International Journal of Intelligent Material Systems and Structures,* Technomic, Lancaster, Pennsylvania, USA, June 1994, pp. 88 – 100.
12. Stochastic boundary elements, Probabilistic Engineering Mechanics, CMPL, vol. 12, no. 4, 1997, pp. 290–294.
13. Finite elements beyond Courant's Triangulation, Innovation in Mathematics, Computational Mechanics Publication, Ashurst, UK, May 1997, pp. 107-114.
14. Iterative Simulation for Stochastically Nonlinear Large Variability, J. Aero. Enggr. ASCE, vol. 13, no. 1, January 2000, pp. 11–16.
15. Green's Functions for Random Media, J. Chinese Institute of Engineers, Nat. Taiwan Univ. Sc. and Tech. Taipei, Taiwan, vol. 23, no. 3, May 2000, pp. 1–8.
16. Interpolants Within Convex Polygons: Wachspress' Shape Functions, *Journal of Aerospace Engineering,* ASCE, vol. 16, no. 1, January 2003, pp. 1–8.
17. Integration Within Polygonal Finite Elements, *Journal of Aerospace Engineering,* ASCE, vol. 16, no. 1, January 2003, pp. 9–18.
18. Closed-Form Isoparametric Shape Functions of Four-Node Convex Finite Elements,

Journal of Aerospace Engineering, ASCE, Vol. 21, Issue 1,January 2008, pp. 10-18.

19. Stiffness Matrices of Isoparametric Four-Node Finite Elements by Exact Analytical Integration, *Journal of Aerospace Engineering,* ASCE, Vol. 21, Issue 2, April 2008, pp. 45-50.
20. Stochastic shape functions and stochastic strain-displacement matrix for a stochastic finite element stiffness matrix, *Acta Mechanica,* Springer Verlag, Wien, vol. 195, no. 1-4, 2008, pp. 379 – 395.
21. Incompressible and Locking-free Finite Elements from Rayleigh Mode Vectors, *Acta Mechanica,* Springer Verlag, Wien, vol. 223, no. 8, 2012, pp. 645 – 1656,

Refereed Sections in Archived Books

22. Sommerfeld radiation conditions and cloning algorithm, New Concepts in Finite Element Analysis, American Society of Mechanical Engineers, New York, NY, AMD-vol. 44, 1981, pp. 47–66.
23. *Numerical Methods for Transient and Coupled Problems,* Editors: P. Bettess, E. Hinton, R. W. Lewis, Wiley series in numerical methods in engineering, Venice, Italy, 9-13 July 1984
24. Green's functions for inhomogeneous media for boundary elements, *Advances in Boundary Elements,* CMPL, 1989, pp. 37-46.
25. Boundary elements with macro shape functions, *Advances in Boundary Elements,* CMPL, 1989, pp. 253-262.
26. Reliability analysis with `Interval` arithmetic, *Mathematics with Vision,* Computational Mechanics Publication, Ashurst, UK, 1995, pp. 111-118.
27. Tessellica: A defect-free finite element paradigm, *Journal on Logic, History and Educational Computing,* Computer Science, Helsinki University of Technology, Helsinki, Finland, 1996, pp. 230-242.
28. Finite Elements beyond Courant's Triangulation, *Innovation in Mathematics,* Computational Mechanics Publication, Ashurst, UK, 1997, pp. 107-114.
29. System Stochasticity: Discrete Formulation with Mathematica, *IMS*'99,CD Publication #56, Research Institute for Symbolic Computation Hagenberg, Austria, 1999. Download from: `http://www.risc.jku.at/about/conferences/summer99/ims99/`

Joint Publication: Archived Journal Papers

30. Chopra, A. K., Chakrabarty, P. and Dasgupta, G, Dynamic stiffness matrices for viscoelastic half-plane foundations, Journal of the Engineering Mechanics Division, ASCE, vol. 102, no. EM3, proc. paper 12209, June 1976, pp. 497–514.

31. G. Dasgupta and J. M. Kelly, Projectile impact on a thin, flexible structure: A singular dynamic contact phenomenon, Journal of Structural Mechanics, Marcel Dekker, vol. 5, no. 1, 1977, pp 19 – 31.

32. G. Dasgupta and J. L. Sackman, An alternative representation of the elastic-viscoelastic correspondence principle for harmonic oscillations, Journal of Applied Mechanics,

American Society of Mechanical Engineers, New York, NY, vol. 99, no. 1, March 1977, pp. 57 – 60.

33. G. Dasgupta and J. M. Kelly, Analysis of localized dynamic contact on structures using matched asymptotic expansions, Journal of Structural Mechanics, Marcel Dekker, vol. 6, no. 1, 1978, pp 29 – 44.

34. G. Dasgupta and J. L. Sackman, A Quadrature representation of the viscoelastic analogy in the frequency domain, Journal of Applied Mechanics, ASME, vol. 45, December 1978, pp 955 –956.

35. G. Dasgupta and A. K. Chopra, Dynamic stiffness matrices for viscoelastic half planes, J. Engineering Mechanics Division, ASCE, New York, NY, vol. 105, no. EM5, October 1979, pp. 729 – 745.

36. M. L. Moss, R. Skalak, G. Dasgupta and H. Vilmann, Space, time, and space-time in craniofacial growth, American Journal of Orthodontics, C. V. Mosby, vol. 77, no. 6, June 1980, pp. 591 – 612.

37. M. L. Moss, H. Vilmann, G. Dasgupta and R. Skalak, Craniofacial growth in space-time, Craniofacial Biology, Monograph no. 10, Craniofacial growth series, Center for Human Growth and Development, 1981, pp. 61 – 81.

38. R. Skalak, G. Dasgupta, M. L. Moss, E. Otten P. Dullemeijr, and H. Vilmann, Analytical Description of Growth, Journal of Theoretical Biology, vol. 94, 1982, pp. 555 – 577.

item L-J Lee and G. Dasgupta, Interaction of nonlinear interiors with linear infinite exteriors, Computers and Structures, Pergamon Press, vol. 20, no. 1, 1985, pp. 339–353.

39. X. Lee and G. Dasgupta, Analysis of structural variability with computer algebra, Journal of Engineering Mechanics, ASCE, New York, NY, vol. 114, no. 1, January 1988, pp. 161 – 171.

40. Yamazaki, F., Shinozuka, M., and Dasgupta, G.: Neumann expansion for stochastic finite element analysis, J of Enggr. Mech., ASCE, vol 114, no. 8, 1988, pp 1335–1354.

41. A. P. S. Selvadurai and G. Dasgupta, Harmonic response of smoothly embedded rigid sphere, Journal of Engineering Mechanics, ASCE, New York, NY, vol. 116, no. 9, September 1990, pp. 1945 – 1958.

42. O. Vilmann, and G. Dasgupta, Fundamental solutions for stochastic Mindlin plates, International Journal of Engineering Analysis, CMPL, vol. 9, 1992, pp. 47–59.

43. Gyebi, O. K., and Dasgupta, G., Finite element analysis of viscoplastic soils with Q-factor, International Journal for Soil Dynamics and Earthquake Engineering, Springer Verlag, vol. 11, no. 4, 1992, pp. 187-192.

44. McAlarney, M. E. , G. Dasgupta, M. L. Moss and L. Moss-Salentijn, Anatomical macroelement in the study of cranial facial rat growth, Journal of Cranial Facial Growth and Developmental Biology, New York, New York, USA, vol. 12, 1992, pp. 3–12.

45. Weiner, C, M. Sára, G. Dasgupta and U. B. Sleytr, Affinity Cross-Flow Filtration: Purification of IgG with a Novel Protein Affinity Matrix Prepared from Two-Dimensional Protein Crystals, Biotechnology and Bioengineering, John Wiley, vol. 44, 1994, pp. 55 – 65.

46. Andre S. Publico and M. E. McAlarney and L. Moss-Salentijn and G. Dasgupta, Further investigations into a non-landmark tensorial form difference tecnique, Bioengineering 1997, American Society of Mechanical Engineers, April 1997, pp. 565–566.

47. Gautam Dasgupta and Jacques Treil, "Maxillo-Facial Frame: Finite Element Shapes," *The Mathematica Journal,* vol. 8, no. 3. 2001, pp. 235–246.

48. Elisabeth A. Malsch and Gautam Dasgupta, "Interpolation constraints and thermal distributions: a method for all non-concave polygons, Book of Abstracts, 14th US National Conference: Special Mechanics Session in Honor of Bruno Boley," *International Journal of Solids and Structures,* vol. 41, no. 8, 2004, pp. 2165–2188.

49. Elisabeth A. Malsch and Gautam Dasgupta, "Algebraic construction of smooth interpolants on polygonal domains," *Challenging the Boundaries of Symbolic Computation,* Imperial College Press 2003
Download: `http://library.wolfram.com/infocenter/Books/4957/`

    vol. 9, no. 6., issue 3, 2004.

50. Elisabeth A. Malsch, John Jeffy Lin and Gautam Dasgupta, Smooth two dimensional interpolants: a recipe for all polygons, *Journal of Graphics Tools*, Volume 10, Number 2, 2005, pp. 27 – 39.
Download: `http://jgt.akpeters.com/papers/MalschEtAl05/`

Teaching at Columbia University (from 1977)

The levels are indicated in parentheses
key: 1000–Freshman, 3000–Junior/senior, 4000–Senior/MS, 6000–MS/PhD, 8000–PhD

1. Undergraduate courses

   (1) Mechanics of solids (3000)
   (2) Structural analysis (3000)
   (3) Dynamics and vibrations (3000)
   (4) Partial differential equations (3000)
   (5) Computer programming with FORTRAN (1000)
   (6) Gateway Lab: Introduction to *Mathematica* (1000)

2. Graduate courses

   (1) Partial differential equations (4000)
   (2) Mechanics of solids (4000)
   (3) Structural analysis (4000)
   (4) Finite element method (4000)
   (5) Advanced finite element method (6000)
   (6) Computer aided engineering graphics (4000)
   (7) Reliability analysis (4000)
   (8) Mechanics of fracture and fatigue (4000)
   (9) Advanced mechanics of solids: viscoelasticity and plasticity (4000)
   (10) Continuum mechanics: elasticity (6000)
   (11) Continuum mechanics: elasticity (8000)
   (12) Continuum mechanics: inelasticity (8000)
   (13) Plates and Shell (4000)

3. Research & Report

   (1) Stochastic finite element method (6000)
   (2) Morphometric shape analysis (6000)
   (3) Stochastic boundary element method (6000)
   (4) Surface graphics (6000)