Karan Govil

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EDUCATION

PENNSYLVANIA STATE UNIVERSITY University Park, PA
Ph.D., Physics (GPA: 3.8/4.0), May 2015 (expected)

INDIAN INSTITUTE OF TECHNOLOGY Chennai, India
Master & Bachelor of Technology, Aerospace Engineering (GPA: 8.2/10.0), May 2009

RESEARCH EXPERIENCE

PENNSYLVANIA STATE UNIVERSITY June 2010 - Present
Graduate Research Assistant, Dept. of Physics (PI: Prof. Murat Günaydin)

Jordan algebras, dualities & exact solutions to higher spin theories Jan 2014 - Present

- Developed a formalism to relate Jordan algebras and higher spin theories.
- Conjectured new dualities between certain sectors of higher spin theories in two, five & seven dimensions.
- Innovated a novel solution to non-linear equations of motion for higher spin theories in curved spaces in four and six dimensions.

Higher spin algebras and twistors in four & six dimensions Nov 2012 - Dec 2013

- Developed a novel formalism for defining conformal higher spin algebras using the quasiconformal methods.
- Discovered the existence of infinite families of higher spin algebras and their supersymmetric extensions in four and six dimensions.
- Conjectured new holographic dualities between interacting conformal field theories in four and six dimensions, and curved space higher spin theories in five and seven dimensions respectively.

Minimal unitary representations of exceptional superalgebra $D(2,1;\alpha)$ June 2010 - Nov 2012

- Formulated the minimal unitary representation of $D(2,1;\alpha)$ using quasiconformal methods and obtained a one-parameter family of deformations of this representation.
- Proved a conjecture about the relation between quaternionic Kähler non-linear sigma models in harmonic superspace and minimal unitary representations of their isometry groups.

INDIAN INSTITUTE OF TECHNOLOGY, MADRAS January 2008 - April 2009
Masters thesis, Applied Physics **(PI: Prof. P.C. Deshmukh)**

- Conceived novel relativistic correlation confinement resonances in the Xenon $5s$ photoionization due to the cascading of spin-orbit interaction activated inter channel coupling effect in $4d$ photoionization.

INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY May 2007 - Aug 2007
Summer Fellow, Dept. of Aerospace Engineering **(PI: Prof. Sudarshan Kumar)**

- Analysis of compressor instabilities: Performed a detailed investigation of Moore-Grietzer model with first order Galerkin approximation at throttle values close to the equilibrium value. Obtained numerical results showing instabilities and limit cycle behavior in the phase plots.

TECHNICAL SKILLS

Computer Languages:	C++, Python (SciPy, NumPy, Pandas, Scikit, Gensim Matplotlib), HTML/CSS
Tools:	SQL, AWS, MongoDB, Git, SVN, Vim, Linux, LaTeX
Scientific Computing:	Mathematica, MATLAB, R

PEER REVIEWED PUBLICATIONS

- **K. Govil**, & M. Günaydin, "Quasiconformal action, quaternionic discrete series & spherical vectors: $SU(2,2)$", In Preparation
- **K. Govil**, M. Günaydin, E. Skvortsov & M. Taronna, "Jordan algebras, dualities & exact solutions to higher spin theories", In Preparation
- **K. Govil**, & M. Günaydin, "Deformed twistors and higher spin conformal (super-) algebras in four dimensions", Journal of High Energy Physics (in press)
- **K. Govil**, & M. Günaydin, "Deformed twistors and higher spin conformal (super-) algebras in six dimensions", Journal of High Energy Physics, 2014(7), 1-28.
- **K. Govil**, & M. Günaydin, "Minimal unitary representation of $D(2,1;\lambda)$ and its $SU(2)$ deformations and $d = 1, \mathcal{N} = 4$ superconformal models", Nuclear Physics B, 2012, 869(1), 111-130.
- **K. Govil**, & P.C. Deshmukh, "Quadrupole photoionization of endohedral Xe@C_{60}", Journal of Physics B: Atomic, Molecular and Optical Physics, 2009, 42(17), 175003.
- **K. Govil**, A.J. Siji, & P.C. Deshmukh, "Relativistic and confinement effects in photoionization of Xe", Journal of Physics B: Atomic, Molecular and Optical Physics, 2009, 42(6), 065004.

INVITED TALKS AND CONFERENCES

- **ETH, Zürich** (October 29, 2014) - Aspects of Higher Spin Symmetries in Various Dimensions.
- **Max Plank Institut for Gravitationphysik (Albert Einstein Institute), Potsdam** (October 27, 2014) - Aspects of Higher Spin Symmetries in Various Dimensions.
- **ULB, Brussels** (October 24, 2014) - Aspects of Higher Spin Symmetries in Various Dimensions.
- **Imperial College, London** (October 22, 2014) - Aspects of Higher Spin Symmetries in Various Dimensions.
- **King's College, London** (October 20, 2014) - Aspects of Higher Spin Symmetries in Various Dimensions.
- **30th International Colloquium on Group Theoretical Methods in Physics, Ghent, Belgium** (July 2014), oral presentation - Higher spin algebras and holography in AdS_5 and AdS_7.
- **Strings Conference, Princeton University, USA** (June 2014), poster presentation - Higher spin algebras and holography in AdS_5 and AdS_7.
- **44th AIAA Joint Propulsion Conference & Exhibit, Hartford, CT, USA**, oral presentation by coauthor Dr. Sudarshan Kumar - Analysis of non-recoverable stall and other instabilities using Moore-Greitzer model.

AWARDS & TEACHING ACTIVITIES

- **NSF Fellowship** to attend and give a talk at 30th International Colloquium on Group Theoretical Methods in Physics, Ghent, Belgium — July 2014
- **Graduate Teaching Award**, Dept. of Physics, Pennsylvania State University — 2013 - 2014
- **David. C. Duncan Graduate Fellowship** for excellence in research — 2010-2014
- **Clifford Roberts Graduate Fellowship** for excellence in research — 2009
- **Teaching assistant** for undergraduate physics courses (mechanics, electricity & magnetism, thermal physics, wave motion, quantum physics, & introductory physics) at Pennsylvania State University for over 5 years; guided over 200 students every week through discussions and computer based laboratories for undergraduate physics courses and helped improve course curriculum.