

# Curriculum Vitae

**HAMED GHAEMIDIZICHEH**



*Born: May 12, 1986, Tehran, Iran*

*Gender: Male*

*Nationality/Citizenship: Iranian*

*Marital Status: Engaged(To Delaram Mirfendereski)*

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## ***Education***

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***M.Sc.: High Energy Physics***

***2009-2012***

*Physics Department*

*Isfahan University of Technology (IUT)*

*Isfahan, Iran*

*Supervisor: Prof. Ahmad Shirzad*

*Total GPA: 17.00/20*

*Thesis score:18.90/20*

***B.sc.: Atomic Physics***

***2004-2009***

*Physics Department*

*Isfahan University*

*Isfahan, Iran*

***GRE SUBJECT(PHYSICS):760***

## ***Awards & Honors***

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- Ranked 432 among more than 150000 participants in the National Graduate University Entrance Exam of Iran, 2009.
- Ranked top 1.5% among more than 350,000 participants in the National Undergraduate University Entrance Exam of Iran, 2004.
- Ranked 3th in GPA among M.Sc. students in particle physics at Isfahan University of Technology (IUT), Iran, at first semester, 2004.

## ***Graduate Passed Courses***

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### **B.Sc.**

- Quantum Mechanics, (Quantum Mechanics, *A modern Development* by Ballentine L.)

### **M.Sc.**

- Quantum Mechanics1(*Modern Quantum Mechanics* by J.J.Sakurai)
- Quantum Mechanics2(*Modern Quantum Mechanics* by J.J.Sakurai)
- Group Theory(*Group Theory In Physics* by Wu-Ki Tung ,*Lie Algebras In Particle Physics* by H.Georgi)
- Statistical Physics(*Statistical Mechanics* by R.K.Pathria)
- Electrodynamics(*Classical Electrodynamics* by Jackson)
- Particle Physics1(*Quarks and Leptons: An Introductory Course In Modern Particle Physics* by F.Halzen& D.Mrtin)
- Particle Physics2(*Electroweak Theory* by Emmanuel A.Paschos)
- Grand Unified Theories(*Grand Unified Theories* by Graham G.Ross ,*Gauge Theory of Weak Interactions* by G.Muller ,*Group Theory for Unified Model Building* by R.Slansky)

## *Current Research*

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- "Different metrics and the Quantum Field Theory in 2+1-dimensional de-Sitter Space"

Colleagues: 1. Prof. Farhang Loran, Associate Prof., Physics Department, Isfahan University of Technology, Isfahan, Iran,

2. Delaram Mirfendereski, M.Sc., Physics Department, Isfahan University of Technology, Isfahan, Iran,

"As it is understood until now, it is possible to define de-Sitter space by using different coordinate systems which leading to different metrics, some describe the space-time as a dynamic universe and the others give a static description. It means that in some regions of space, one could define two or more metrics with totally different physical treatment which have intersection with each other. However, in some cases it is not straightforward to determine the explicit form of coordinate transformations between these metrics in their so-called "intersection regions". On the other side, one could establish the QFT for each of these metrics. The main question is that which of physical quantities are protected from differences between these metrics (and so are suitable physical observables) and which of them make some misunderstanding for us to interpret physical events correctly in de-Sitter space. "

## *M.Sc. Research Experience*

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- "Light Cone Quantization of Scalar, Fermionic and Dirac field via Symplectic approach" as my M.Sc. Thesis under supervision of Prof. Ahmad Shirzad.

"The quantization of "Scalar", "Fermionic" and "Electromagnetism" field in light cone coordinate via Dirac's method and Symplectic approach is studied in this dissertation.

The Light Cone coordinate was introduced as one of candidates for forms of dynamical variables by Dirac in 1949. In this coordinate, the time component of space-time four-vector at each point is perpendicular to the light cone surface. Two other different coordinate forms have been introduced by Dirac, "Instant Form" and "Point Form". Time component in "Instant Form" is chosen as usual as we use in ordinary physics and in "Point Form" time component is perpendicular to light cone

hyperboloid surface. The Light Cone Coordinate also has application in different areas of physics such as nonperturbative QCD, String theory, Ads/Cft etc.

As we will show in this thesis, additional second class constraints emerge within expressing field theory in light cone coordinate. The Dirac's approach as in its ordinary framework helps us to quantize constraint system and find the commutation relation between fields and their conjugate momenta. For this purpose we use Dirac bracket definition and finally convert it to commutator. By using this method in light cone quantization it can be depicted that the commutation relation between fields and their conjugate momenta in this coordinate differs from ordinary one. For instance, there is noncommutativity between scalar fields in this coordinate in equal light cone time. This noncommutativity happens also in "Fermionic" and "Electromagnetism field". One indirect way to find commutation relation between creation and annihilation operator in light cone quantization by Dirac's method is to use commutation relation between fields and their conjugate momenta. In some models also, in Light Cone coordinate such as "Fermionic", "Electromagnetism" and "Yang-Mills theory" we encounter numbers of constraint, so it makes some difficulties in computing the inverse of constraint matrix. We suggest Symplectic method to find commutation relation between creation and annihilation operators directly and as we will see quantization of field theory by this method is more simple than Dirac's method. Symplectic approach applied in Light Cone Quantization in recent years.

The Symplectic method that we use in this dissertation based on further expansion of fields and their conjugate momentums in terms of schrodinger modes. By applying constraint relations, the unphysical modes are removed and we can find the Dirac bracket of modes by means of Symplectic two form. By using this Dirac bracket we can also find the commutation relation between fields and their conjugate momenta. These commutation relations are same as Dirac's method. Two other problems are also investigating in this thesis, the physical modes and the propagator in Light Cone field theory. The form of propagator can be used as one way to show equivalency between

Light Cone coordinate and ordinary one. In this thesis, the Dirac and Symplectic approach are used for Scalar, "Fermionic" and "Electromagnetism" field. The propagator is also computed for "Scalar" and "Fermionic" field. By applying the Symplectic approach it can be seen that extra constraints do not change the number of independent modes in three fields. The propagator of Scalar and Fermionic fields in Light Cone coordinate is computed as same as propagator in ordinary coordinate."

- Ghaemidizicheh.H and Shirzad.A (Light Cone Quantization of Scalar, Fermionic and Electromagnetism Field via Symplectic Approach), Accepted in The Annual Physics Conference of Iran, August 27-30.2012,University of Yazd.

## ***B.Sc. Research Experience***

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- Ghaemi.H and Mirfendereski.D (*Consideration of single-slit problem via Feynman path integral formalism*), Presented in The Annual Physics Conference of Iran, August 27-30.2007,Yasouj University.
- Constrain Structure of field theory at Light Cone Coordinate (LF Quantization) as my M.Sc. Thesis under supervision of Prof. Ahmad Shirzad.
- Presenting a paper titled "Free Understanding of Quantum Mechanics" page 47 in internal student's journal, Potential # 12, fall and Winter of 2006,Isfahan University.

- Presenting a paper titled ‘ ‘ Nanolithography’ ’ in the section of Special View of Quantum Nanostructure, pages 70-73 in internal student’s journal, Potential # 12, Fall and Winter of 2006, Isfahan University.

## ***Teaching & Academic Experience***

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- Physics Lab. Teacher, Isfahan University of Technology, 2010.
- Physics Lab. Teacher, Isfahan University of Technology, 2011.
- Physics Lab. Teacher, Isfahan University of Technology, 2012.
- Responsible manager of student’s journal of potential, journal # 12, Fall and Winter of 2006 which was appreciated in the Conference of Student and Scientific Journals in Tehran University in 2007.
- Membership in the Central Council of Student and Scientific Association of Physics of Isfahan University in 2005 and 2006.
- Membership in the Executive Board of the Conference of the Global Year of Physics held in Isfahan University in 2005.
- Membership in Research Group of Nano technology and holding conferences and study sessions in deferent fields of Nano technology under the supervision of the professors of the Physics Department of Isfahan University.
- Participation and cooperation in Conference of the Secretaries of Iranian Student and Scientific Associations held in Isfahan University.

## ***Participation in Conferences***

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- August 28-31, 2006      The Annual Physics Conference of Iran, Shahrod, Iran

- August 27-30, 2007      The Annual Physics Conference of Iran, Yasouj, Iran
- August 25-28, 2008      The Annual Physics Conference of Iran, Kashan, Iran
- August 14-17, 2009      The Annual Physics Conference of Iran, Isfahan, Iran
- January 25, 2007      The National Conference of Gravity & Cosmology, Tehran, Iran
- Reference : [www.psi.ir](http://www.psi.ir)
- December 8-9, 2010      Conference on Recent Progress in foundation of Physics, Tehran (IPM), Iran
- September 4-7, 2011      IPM school and workshop on recent developments in Particle Physics (IPP11), Tehran (IPM), Iran
- Reference: [www.physics.ipm.ac.ir](http://www.physics.ipm.ac.ir)

## ***Skills***

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- Languages: Persian (Native), English (IELTS: 6.0), I have registered for other test at 13 October 2012, Result will be 2 weeks later
- Computer skills: Microsoft Office (Word, Excel, Power Point) Maple, Mathematica, Delphi

## ***Research Interests***

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Mathematical Physics

Theoretical High Energy Physics

Geometry of Physics  
String Theory

Ads/Cft Duality

# References

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- Rasoul Roknizadeh, Associate Professor of Physics

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