Curriculum Vitae

Kamalika Hajra (Basu)

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Date of Birth: 28/06/1979

Current Designation: Assistant Professor

Broad Area of Research: Theoretical Condensed Matter Physics
Subject of Research: Complex Networks and their Applications
Master Degree Advanced paper: High energy Physics and Particle Physics

Employment

Institute	Designation	Date of joining	Date of Leaving
Saha Institute of Nuclear Physics	Visiting Scientist and Post Doctoral Fellow	March, 2009	June 2011
St. Xavier's College, Kolkata	Guest Lecturer	August,2010	December, 2010
Heritage Institute of Technology	Assistant Professor	July, 2011	February, 2015
Acharya Jagadish Chandra Bose College, Kolkata	Assistant Professor	February, 2015	Still working

Educational Qualifications

Degree/Examination	**Institute**	**University/ Board)**	**Year of passing**	**Percentage of Marks**
Post Doctorate	Saha Institute of Nuclear Physics	NA	NA	NA
Doctorate (Physics)	University College of Science Technology and Agriculture	University of Calcutta	2009	NA
M.Sc (Physics)	University College of Science Technology and Agriculture	University of Calcutta	2003	75%
B. Sc (Physics Hons)	St. Xavier's College, Kolkata	University of Calcutta	2001	75.8%
Higher Secondary	Loreto Day School, Sealdah	WBCHSE	1998	79%
Madhyamik	Loreto Day School, Sealdah	WBBSE	1996	81.3%

Distinctions and Scholarships:

(1) CSIR NET fellowship (JRF)
(2) CSIR NET fellowship (SRF)
(3) University rank 3rd in M. Sc Part II
(4) University rank 1st in M. Sc Part I
(5) Scholarship for being student with highest marks in BSc studying MSc

(6) University rank 5th in B.Sc (also college topper)

List of Publications:

1. Effect of a static phase transition on searching dynamics.

   Kamalika BasuHajra and Parongama Sen J. Stat. Mech. (2007) P06015

2. Modelling temporal and spatial features of collaboration network.

   Anjan Kumar Chandra, Kamalika Basu Hajra, Pratap Kumar Das and

   Parongama Sen, Int. Jour. Mod. Phys. C. vol 18 ,7 (2007) 1157-1172

3. Earthquake aftershock networks generated on Euclidean spaces of different fractal geometry.

   Kamalika Basuhajra and Parongama Sen, arXiv.org/cond-mat0609126 (2006)

4. Modelling Aging characteristics in citation networks.

   Kamalika BasuHajra and Parongama Sen, Physica A, 368/2,pp575-582 (2006)

5. Aging in citation networks.

   Kamalika BasuHajra and Parongama Sen, Physica A, vol.346, pp:44-48 (2004)

6. Phase transitions in an aging network.

   Kamalika BasuHajra and Parongama Sen, Phys. Rev E, Vol. 70, 056103(2004)

7. A brief study on coevolution of Ising dynamics.

   Kamalika BasuHajra and A. K. Chandra, The European Physical Journal B 85: 27 (2012)

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Teaching Experience:

Institute	**Subject Delivered**
Acharya Jagadish Chandra Bose College, Kolkata	(a) Quantum Mechanics and Atomic Physics (3rd yr Honours course) (b) Physical Optics (2nd yr Honours course) (c) Mathematical Methods-I (1st yr Honours course) (d) Communications (3rd yr general course) (e) Physical optics (2nd yr general course) (f) General properties of matter (1st yr general course)
Heritage Institute of Technology, Kolkata	(a)Physical Optics- Interference and Fraunhofer diffraction (b) Vector Calculus (c) Electrostatics and Dielectrics (d) Quantum Physics (e) Introduction to Crystallography (f)Vibrations and oscillations (g)Introduction to Holography
St. Xavier's College, Kolkata	Kinetic theory of gases

Brief Description of published works:

(1)Phase transitions in an aging network

We have considered a growing network in which an incoming node gets attached to

the i^{th} existing node with the probability $\Pi_i \infty\ k_i^{\beta} \tau_i^{\alpha}$, where k_i is the degree of the i^{th}
node and τ_i its present age. The phase diagram in the $\alpha - \beta$ plane is obtained. The network shows scale-free behaviour, i.e., the degree distribution $P(k)\ k_i^{-\gamma}$ with
$\gamma = 3$ only along a line in this plane. Small world property, on the other hand, exists over a large region in the phase diagram.

(2) Aging in citation networks:

In many growing networks, the age of the nodes plays an important role in deciding
The attachment probability of the incoming nodes. For example, in a citation network, very old papers are seldom cited while recent papers are usually cited with high frequency. We study actual citation networks to find out the distribution T(t) of t, the time interval between the published and the cited paper. For different sets of data we find a universal behaviour: $T(t) \sim t^{-0.9}$ for $t \leq t_c$ and $T(t) \sim t^{-2}$ for $t > t_c$ where $t_c \sim O(10)$.

(3)Modeling Aging characteristics in citation networks.:

Growing network models with preferential attachment dependent on both age and degree
are proposed to simulate certain features of citation network. In this directed network,
a new node gets attached to an older node with the probability ~ K(k)f(t) where the
degree and age of the older node are k and t respectively. Several functional forms of
K(k) and f(t) have been considered. The desirable features of the citation network can
be reproduced with $K(k)\ k^{-\beta}$ _ and $f(t)\ \exp(\alpha t)$ with $\alpha = 0.2$ and $\beta = 2.0$
along with simple modifications in the growth scheme.

(4)Temporal and spatial features of collaboration network:

The collaboration network is an example of a social network which has both non-trivial
temporal and spatial dependence. Based on the observations of collaborations in Physical Review Letters, a model of collaboration network is proposed which correctly reproduces the time evolution of

the link length distributions, clustering coefficients, degree distributions and assortative property of real data to a large extent.

(5)Effect of a static phase transition on searching dynamics:

We consider a one dimensional Euclidean network which is grown using a preferential
attachment. Here the j^{th} incoming node gets attached to the i^{th} existing node with
the probability $\Pi_i \infty k_i l_{ij}^{\alpha}$ where l_{ij} is the Euclidean distance between them and k_i
the degree of the i^{th} node. This network is known to have a static phase transition point at
$\alpha_c \approx 0.5$. On this network, we employ three different searching strategies based on degrees or distances or both, where the possibility of termination of search chains is allowed. A detailed analysis shows that these strategies are significantly affected by the presence of the static critical point. The distributions of the search path lengths and the success rates are also estimated and compared for the different strategies. These distributions appear to be marginally affected by the static phase transition.

(6)Earthquake aftershock networks generated on Euclidean spaces of different fractal geometry.:

According to some recent analysis of earthquake data, aftershock epicenters can be considered to represent the nodes of a network where the linking scheme depends on severalfactors. In the present paper a model network of earthquake aftershock epicenters is proposed based on this scheme and studied on fractals of different dimensions. The various statistical features of this network, like degree, link length, frequency and correlation distributions are evaluated and compared to the observed data. The results are also found to be independent of the fractal geometry.

(f) **A brief study on coevolution of Ising Dynamics**:

Here coevolution of site state and network structure is considered from different initial substrates, viz., a one dimensional Ising chain, a scale free network and a network with non linear degree dependence. The dynamics is governed by a preassigned stability factor “S” and a rewiring factor ϕ , that decides whether the Ising spin at a given site flips or the site gets rewired to another site in the system. When steady state average stability and magnetization are observed for

different initial conditions, we see that the average stability shows almost similar behavior, whereas the magnetization definitely depends on the starting condition. In addition to the local dynamics, global effects on the system have also been studied which show interesting variations in the steady state values of average stability and magnetization for different values of S and ϕ and this study helps in indicating gradual change of existing social networks.

CONFERENCES ATTENDED:

(1) National Conference on Mathematical trends in Physical Sciences, August, 2014, Department of Physics and Mathematics, Heritage Institute of Technology, Kolkata.

(2)Complex systems and social networks, 24-25 January, 2013, Department of Computer Science and Engineering, Heritage Institute of Technology, Kolkata

(3)CMDS-12 International Symposium on Continuum Models and Discrete Systems, 21-25 Feb 2011, Saha Institute of Nuclear Physics, Kolkata

(4)Statphys Kolkata VII
Saha Institute of Nuclear Physics, Kolkata (2010)

(5) ECONOPHYSICS-KOLKATA V **:** International Workshop on Econophysics of Order-driven Markets, 9 - 13 March, 2010, Saha Institute of Nuclear Physics, Kolkata

(6) ICTS sponsored workshop on Non Equilibrium Statistical Physics
IIT Kanpur, India (2010)

(7) Workshop and Hands-On Session on High Performance Computation (parallel computing)
S. N. Bose National Center for Basic Sciences, Kolkata (2009)

(8) STATPHYS KOLKATA- VI
Ffort Radisson, Raichak, India (2007)

(9) International Conference on Quantum Annealing.
SINP, Kolkata (2005).

(10) International Workshop of Econophysics of Wealth Distributions.
SINP, Kolkata (2005)

(11) STATPHYS KOLKATA-V

SNBNCBS, Kolkata (2004)

(12) International Workshop on Complex Systems.
SINP (in collaboration with Santa-Fe Inst., USA) (2002)