The University of Texas at El Paso Bioinformatics Program
Internship Proposal Form

All students in the Bioinformatics MS program are required to do an internship. The student is responsible for securing an internship offer from an academic, industry, or government institution, which is a current or potential employer of bioinformatics professionals. For the internship to count towards the MS degree in Bioinformatics, the student must provide all required information on the first page of this Internship Proposal form and submit the form to the Bioinformatics Program Office to obtain approval from the Program Committee and Graduate Advisor before the start of the internship. Please read the guidelines on next page carefully when preparing your proposal. Submit this proposal form at least two weeks before the intended internship starting date.

An evaluation form will be sent to the student's Internship Supervisor at the end of the internship period. The student must receive an overall grade of "Satisfactory" or better in order to fulfill the requirement of this degree. In addition, those students who are using their internship work for course credits will be required to submit an internship report. The course grade will depend on both the Internship Supervisor's evaluation as well as the quality of the report. Students should consult the course instructor regarding requirements of the report.

1. **Student Name and UTEP ID:**
   Joseph Knapka
   80463762
2. **Organization offering internship:** (A written internship offer from the organization must be submitted along with this form.)
   New Mexico State University

3. **Duration of internship:**
   Starting date: April 3, 2015
   Ending date: August 15, 2015
   Estimated total number of working hours: 160
4. **Internship Supervisor:**
   Name: Dr Joe Song
   Position in organization: Associate Professor, Computer Science
   Mailing address: Department of Computed Science
   New Mexico State University
   P.O. Box 30001, MSC CS
   Las Cruces, NM 88003

   Phone and fax: 575-646-4299; fax 575-646-1002
   Email: joemsong@cs.nmsu.edu
5. **On separate paper, summarize in your own words the work you plan to do during the internship. Please do not exceed 400 words.**

Student Signature: _____ **Date:** 5-28-2015

The Bioinformatics Program Committee will consider each internship proposal according to the following guidelines:

1. The internship proposal can be considered only if the student is enrolled as a graduate student in the Bioinformatics MS Program and is in good academic standing according to the requirements of the UTEP Graduate School.
2. The organization offering internship should be an academic, industry, or government institution which is a current or potential employer of bioinformatics professionals. The internship may be paid or unpaid. It is the student's responsibility to ensure that he/she has sufficient resources for financial support during the entire duration of the internship. A letter from the organization offering internship should be submitted along with the proposal form.
3. A student should seek an internship outside of UTEP to expand his/her professional experience. In extremely unusual situations, the committee may consider a proposal for internship at UTEP. In such a case, the student MUST submit a letter along with this Internship Proposal form to the committee, clearly explaining the reasons for which it is not possible to go for internship outside of UTEP. The letter should also document what kind of schedule arrangements the student has made in order to carry out the proposed internship work at UTEP.
4. Generally, the internship should involve a minimum of four weeks of full time work (160 working hours in total) at the organization. If the internship work is conducted in a part-time manner, this minimum total working hour requirement still applies.
5. The student will normally be evaluated by the named supervisor on the proposal form at the conclusion of the internship. (See evaluation form on the next page.) In order to satisfy the internship requirement of the Bioinformatics MS degree, the student must receive an overall grade of "Satisfactory" or better from the supervisor.
6. For the internship to satisfy the requirement of the Bioinformatics MS degree, the proposed work should ideally contain both a biological and an informatics component. In the most general interpretation, the internship should involve a certain amount of computational work applicable to a scientific or technological issue of biological interest.

The Graduate Advisor for the Bioinformatics MS Program will, in consultation with the Program Committee, decide on one of the following actions regarding the internship proposal (Circle or underline one):

1. Approve the internship proposal.
2. Suggest student to revise and resubmit proposal (provide suggestions below).
3. Disapprove the internship proposal (provide reasons below).

Graduate Advisor Signature: _____ Date: _____

University of Texas at El Paso Bioinformatics Program
Internship Evaluation

Dear Colleague,

I wish to thank you for taking time to work with one of our students during his/her internship at your organization. I am sure the internship experience has a great impact in the student's professional training. We shall greatly appreciate it if you could kindly take a few minutes to assess the student's performance.

Sincerely,
Ming-Ying Leung, Ph.D.
Professor and Director of Bioinformatics Program

Student Name:	
Internship Duration:	
Evaluator:	
Title:	
Organization Name and Address:	

Please evaluate the above student intern on the following aspects on a scale of 1 to 5, where 1 = unacceptable, 2 = satisfactory, 3 = good, 4 = very good, 5 = outstanding. Please enter N if you cannot evaluate the student on a particular aspect.

	Aspects of Performance	Rating
1.	Technical skills (academic knowledge, lab techniques, computer skills)	
2.	Communication skills (language fluency, efficiency in expressing and listening)	
3.	Self-motivation to do a good job	
4.	Willingness to work extra time when needed	
5.	Solving problems independently	
6.	Ability to seek and take advice appropriately	
7.	Finishing assigned work on time (meeting deadlines)	
8.	Being a team player	
9.	Being a team leader	
10.	Overall rating of this student intern	

It would be very helpful to our program if you could suggest at least one specific technical or academic area that you would like the intern to have more training in before he/she started working with you. Other comments about the student or suggestions related to their training in our program will also be much appreciated. (Please use more pages as necessary.)

My internship will take place under the supervision of Dr. Joe Song in New Mexico State University's computer science department. Dr. Song's research group is focused on the development and application of statistical tests to identify transcriptional regulatory relationships in complex networks. The group also maps biological pathway topologies in relation to expression data and relates them to differences found within promoter regions. The group includes graduate students from the computer science, biology, and chemistry departments.

This internship will involve computational analysis of gene regulatory networks (GRNs). An initial GRN analysis will be performed, with opportunities for follow-on analyses and further development of computational methods for GRN discovery and characterization.

A GRN is a collection of regulatory proteins and the transcription promoter sites to which they bind, represented (for our convenience) as a network with promoter sites as the nodes and regulator-promoter relationships as edges[1]. Intuitively, the level of activity at a network node corresponds to the expression level of the node's gene, and a network edge describes the excitatory or inhibitory effect of a source gene's product on a target gene's promoter site. Understanding GRN structure can help us interpret gene expression data[2].

During this internship, I will investigate whether and how GRN structure changes with varying biological circumstances. Does a particular GRN perform the same function and have the same regulatory relationships everywhere it appears? Or is the network context-specific, with the edges of the network graph reconfigured depending upon variables such as time, developmental stage, or surrounding tissue?

Song *et al* have developed a statistical test, the comparative chi-square test, and have demonstrated its ability to detect "rewiring" of network relationships, given data about activation levels at network nodes in different experimental conditions[3]. The comparative chi-square test evaluates the likelihood that observed promoter and gene expression levels would appear under different experimental conditions, under the null hypothesis that the regulatory relationships along the network edges are the same under all experimental conditions.

An upcoming paper by Dutta et al[4] presents transcriptome expression levels measured in the five anatomically distinct regions of the drosophila midgut (R1-R5)[5] for four cell types. The cell types profiled are enterocytes (EC) - epithelial cells that perform digestion; enteroendocrine cells (EE) – cells that participate in hormonal signaling; enteroblasts (EB) - precursor cells that differentiate into enterocytes and enteroendocrine cells; and intestinal stem cells (ISC) which replenish the gut lining by differentiating into enteroblasts and subsequently EE and EC cells. I will apply Song et al's techniques to this data in order to determine whether known GRN's extracted from the FlyBase database[6] exhibit structural differences across regions or cell types.

At the conclusion of this internship, I expect to have greatly improved knowledge of the biological principles of gene regulation, and I will have gained extensive practical experience in applying statistical inference techniques to large expression data sets.

References Cited

1. http://younglab.wi.mit.edu/regulatory_network/

2. Modelling and analysis of gene regulatory networks. Karlebach, G and Ron Shmir, Nature Reviews Molecular Cell Biology 9, 770-780 (October 2008) | doi:10.1038/nrm2503

3. Hunting complex differential gene interaction patterns across molecular contexts Song, Joe et al, Nucl. Acids Res. (2014)doi: 10.1093/nar/gku086

4. Regional cell-specific transcriptome mapping reveals the regulatory complexity of the adult Drosophila midgut. Devanjali Dutta, Adam J Dobson, Jerome Korzelius, Christine Gläßer, Philip L Houtz, Nicolas Buchon, Bruce A Edgar. Cell Reports. (under review).

5. FlyGut: an atlas of the *Drosophila* adult midgut. http://flygut.epfl.ch/anatomy

6. FlyBase: A Database of *Drosophila* Genes and Genomes. http://flybase.org/