

## 1. General Information

1a. Submitted by the College of: PUBLIC HEALTH

Date Submitted: 8/11/2014

1b. Department/Division: Dept Of Biostatistics

1c. Contact Person

Name: Andrea Perkins

Email: andrea.perkins@uky.edu

Phone: 218-2021

Responsible Faculty ID (if different from Contact)

Name: Lin Yang

Email: lin.yang@uky.edu

Phone: 218-2248

1d. Requested Effective Date: Semester following approval

1e. Should this course be a UK Core Course? No

## 2. Designation and Description of Proposed Course

2a. Will this course also be offered through Distance Learning?: Yes<sup>4</sup>

2b. Prefix and Number: BMI 735

2c. Full Title: Introduction to BiImage Informatics

2d. Transcript Title:

2e. Cross-listing:

2f. Meeting Patterns

LECTURE: 45

2g. Grading System: Letter (A, B, C, etc.)

2h. Number of credit hours: 3

2i. Is this course repeatable for additional credit? No

If Yes: Maximum number of credit hours:

If Yes: Will this course allow multiple registrations during the same semester?

2j. Course Description for Bulletin: This class provides an introduction to searching and retrieval in biomedical image analysis and imaging informatics. We will introduce some advanced biomedical image analysis, searching, and retrieval algorithm for fast and efficient image searching and retrieval.

- 2k. Prerequisites, if any: BMI-734: Introduction to Biomedical Image Analysis
- 2l. Supplementary Teaching Component:
3. Will this course taught off campus? No  
If YES, enter the off campus address:
4. Frequency of Course Offering: Fall,  
Will the course be offered every year?: Yes  
If No, explain:
5. Are facilities and personnel necessary for the proposed new course available?: Yes  
If No, explain:
6. What enrollment (per section per semester) may reasonably be expected?: 25
7. Anticipated Student Demand  
Will this course serve students primarily within the degree program?: No  
Will it be of interest to a significant number of students outside the degree pgm?: Yes  
If Yes, explain: Will be of interest to Computer Science and engineering students
8. Check the category most applicable to this course: Relatively New – Now Being Widely Established,  
If No, explain:
9. Course Relationship to Program(s).  
a. Is this course part of a proposed new program?: No  
If YES, name the proposed new program:  
b. Will this course be a new requirement for ANY program?: No  
If YES, list affected programs:
10. Information to be Placed on Syllabus.  
a. Is the course 400G or 500?: No  
b. The syllabus, including course description, student learning outcomes, and grading policies (and 400G-/500-level grading differentiation if applicable, from 10.a above) are attached: Yes

## Distance Learning Form

Instructor Name: Lin Yang

Instructor Email: lin.yang@uky.edu

Internet/Web-based: Yes

Interactive Video: No

Hybrid: No

1. How does this course provide for timely and appropriate interaction between students and faculty and among students? Does the course syllabus conform to University Senate Syllabus Guidelines, specifically the Distance Learning Considerations? This course provides timely interaction between students and faculty through blackboard emailing, UK emails, Blackboard announcement, and discussion boards. In addition, AdobeConnect will be used to communicate with students. Yes, this course syllabus conforms to the UK guidelines specific to the distance learning consideration.

2. How do you ensure that the experience for a DL student is comparable to that of a classroom-based student's experience? Aspects to explore: textbooks, course goals, assessment of student learning outcomes, etc. All aspects of the class materials and instruction including textbooks, course goals, assessment of student learning outcomes will be the same as the course is offered in the classroom based setting.

3. How is the integrity of student work ensured? Please speak to aspects such as password-protected course portals, proctors for exams at interactive video sites; academic offense policy; etc. Faculty will be circumspect to monitor plagiarism from online resources and among students; this aspect will be no different from the class-room setting. Password protected Blackboard portal will help retain the integrity and also enforce adherence to submission due dates through time stamping. In addition to mentioning the academic offense policies in the syllabus, the instructor will emphasize the policies during the beginning of the semester in a recorded session so students are given ample opportunity to familiarize themselves with what is considered plagiarism and what consequences they stand to face when resorting to academic dishonesty.

4. Will offering this course via DL result in at least 25% or at least 50% (based on total credit hours required for completion) of a degree program being offered via any form of DL, as defined above? No

If yes, which percentage, and which program(s)? N/A

5. How are students taking the course via DL assured of equivalent access to student services, similar to that of a student taking the class in a traditional classroom setting? Students can interact with the faculty member through the live sessions or offline office hours via physical visit or through phone calls; other ad hoc means of interactive Web based communication can be pursued within the weekly office hour slots. Students can borrow books from the library like regular students. Students will also be encouraged to take advantage of the DL library resources.

6. How do course requirements ensure that students make appropriate use of learning resources? The students are instructed to read research articles, book chapters in line with the weekly lessons defined. The video clips that are carefully chosen to supplement course lecture slides will be provided for further discussions. Practical exercise driven assignments will be given to students to achieve learning goals to assess/review essential contents in biomedical information retrieval.

7. Please explain specifically how access is provided to laboratories, facilities, and equipment appropriate to the course or program. All the readings assigned will be available based on free access, otherwise university licensed-articles. Learning tools and databases assigned for practical exercises will be available on a publicly accessible database, otherwise university licensed product through UK library system. Conventional homework that does not need any programming can be solved using the material (recordings and textbook) and written up using a Word processor.

8. How are students informed of procedures for resolving technical complaints? Does the syllabus list the entities available to offer technical help with the delivery and/or receipt of the course, such as the Information Technology Customer Service Center (<http://www.uky.edu/UKIT/>)? Yes. Additional resources for resolving technical issues are stated on the syllabus, including instructions to notify the instructor immediately.

9. Will the course be delivered via services available through the Distance Learning Program (DLP) and the Academic Technology Group (ATL)? YES

If no, explain how student enrolled in DL courses are able to use the technology employed, as well as how students will be provided with assistance in using said technology. N/A

10. Does the syllabus contain all the required components? YES

11. I, the instructor of record, have read and understood all of the university-level statements regarding DL.

Instructor Name: Lin Yang

SIGNATURE|ALHAYS0|Andrea L Perkins|BMI 735 NEW College Review|20140319

SIGNATURE|CHAPPELL|Joseph Chappell|BMI 735 ZCOURSE\_NEW Approval Returned to Dept|20140425

SIGNATURE|ZNNIKO0|Roshan N Nikou|BMI 735 NEW Graduate Council Review|20140425

SIGNATURE|ZNNIKO0|Roshan N Nikou|BMI 735 NEW Graduate Council Review|20140428

SIGNATURE|ALHAYS0|Andrea L Perkins|BMI 735 ZCOURSE\_NEW Approval Returned to Dept|20140820

SIGNATURE|ALHAYS0|Andrea L Perkins|BMI 735 NEW College Review|20140811

SIGNATURE|ZNNIKO0|Roshan N Nikou|BMI 735 NEW Graduate Council Review|20140926

UNIVERSITY OF KENTUCKY  
COLLEGE OF PUBLIC HEALTH

Last modified: 2/05/2014

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**Course Syllabus**

**BMI735**

**Introduction to BiImage Informatics  
Fall 2014**

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**Classroom and Meeting Hour:  
Multidisciplinary Science Building 221, Wed from 3.00-5.30PM**

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**Contact information**

Course Instructor:	Lin Yang, Assistant Professor
Web:	<a href="http://www.uky.edu/~lya227/">http://www.uky.edu/~lya227/</a>
Office:	230D MDS
Telephone:	859-218-2248
E-mail:	<a href="mailto:lin.yang@uky.edu">lin.yang@uky.edu</a> (Preferred Method of Contact)
Office Hours:	Wednesday afternoon (both physical and virtual) 1.00PM – 3.00PM

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**Course description**

This class will give students an introduction to searching and retrieval in biomedical image analysis and imaging informatics. We will introduce some advanced biomedical image analysis, searching, and retrieval algorithm for fast and efficient biomedical image searching and retrieval. The topics in this class will include:

1. Introduction to advanced searching and retrieval in biomedical imaging informatics
2. Biomedical image retrieval using colors
3. Content based biomedical image searching and retrieval using texture
4. Shape matching and its application for biomedical image searching and retrieval
5. Feature similarity and distance
6. Biomedical image feature selection and visual learning
7. Query language for biomedical image searching and retrieval.
8. Advanced topic in biomedical image searching and retrieval, such as bag of visual words model and relevance feedback.
9. High performance computing using Cloud, Grid and Graphic Processing Unit (GPU)

**Course rationale:**

This class is suitable for a broad spectrum of students who have taken Introduction to Biomedical Image Analysis and Imaging Informatics or have a solid background in statistics, mathematics, computer science, electrical and computer engineering, biomedical engineering, who are interested in learning how to utilize informatics and computational tools to search and retrieve large image datasets (multiple dimensions, multiple modalities) in an efficient, fast, and high throughput manner.

## **Course prerequisites**

BMI-734: Introduction to Biomedical Image Analysis

## **Course objectives**

- Obtain advanced knowledge in biomedical image computing for processing biomedical images to extract quantitative and automatic measurements. Be able to publish high quality research papers in biomedical image analysis and imaging informatics areas.
- Apply the advanced tools and software for building high throughput imaging informatics system

## **Public Health Competencies for Statistics and Informatics**

- Apply basic informatics techniques with vital statistics and public health records in the description of public health characteristics and in public health research and evaluation.
- Appreciate the importance of working collaboratively with diverse communities and constituencies (e.g. researchers, practitioners, agencies and organizations).
- Discuss the influences of social, organizational and individual factors on the use of information technology by end users.
- Collaborate with communication and informatics specialists in the process of design, implementation, and evaluation of public health programs.
- Use information technology to access, evaluate, and interpret public health data.
- Use informatics methods and resources as strategic tools to promote public health.
- Use informatics and communication methods to advocate for community public health programs and policies.

## **College of Public Health Competencies- adopted from MPH Cross-cutting competencies, 2013**

- Organize and deliver effective written and verbal communications about public health activities using appropriate communication strategies to professionals, labor, industry, the general public and the media.
- Use evidence based principles and scientific knowledge effectively when involved in evaluation and decision-making in public health.
- Manage potential conflicts of interest encountered by practitioners, researchers, and organizations.
- Collaborate in interprofessional partnerships to implement organizational initiatives at the individual, organizational, and community level.

## **Student learning outcomes:**

Upon completion of this course, the learner will:

- be able to build a small scale imaging informatics system from scratch;
- be able to develop novel biomedical image analysis algorithm with an emphasis on the areas of interest to the translational and clinical research community
- be able to develop open source tools for radiology, pathology, and biology image processing, indexing, and retrieving,
- be able to understand biomedical image analysis, computer vision, pattern recognition and machine learning terminologies with the focus of biomedical knowledge transfer, be able to utilize the learned knowledge to solve practical research problems.

## **Textbooks (Required)**

- Information Retrieval: A Health and Biomedical Perspective (Health Informatics), William Hersh, Springer, 3<sup>rd</sup> edition, 2008, abbreviated as IR.
- Principle of Visual Information Retrieval, Michael S. Lew, Springer, 2010, abbreviated as RVIR

## **Course requirements and learner evaluation**

For those who take the class for credit, the following course assignments and midterm are required. Course grades will be based upon evaluation of the following activities:

Three Assignments and Midterm (50 points)

- Assignment #1 (10 points): Biomedical image feature extraction
- Assignment #2 (10 points): Biomedical Image searching using K-d tree
- Assignment #3 (10 points): Biomedical image retrieval using relevance feedback
- Midterm (20 points): Closed book midterm exam
- Final exam (50 Points): The final exam will be a competitive team project. Students will be separated into several groups to work on one specific problem. Each group will test their image searching and retrieval algorithm based on the other group's proposed testing data and instructor's testing images. Both the searching/retrieval speed and accuracy will be evaluated. The winning group will get extra credit to compensate for what they lost during their exam. The winning group will also be awarded a certificate.
- Assignment Submission: all assignments are to be submitted via email at [lin.yang@uky.edu](mailto:lin.yang@uky.edu) by each assigned due date (normally Wed 11:59pm, EST).
- Exam: In class exam will be conducted on the designated date.

## **Grade Distribution:**

<i>Points</i>	<i>Letter grade</i>
100-90	A
89-80	B
79-70	C
0-69	E

## **Instructor expectations**

1. I expect you to attend every class session. The components are highly interrelated; missing a class will detract from the learning potential of subsequent sessions.
2. I expect you to be in the classroom and prepared to begin work at the scheduled starting time for each session.
3. I expect you to actively participate in the discussions. This is not the type of class where you can "sit back and listen."
4. I expect you to submit papers using proper English grammar, syntax, and spelling. You are encouraged to use spell check and grammar check prior to submitting your written work. The Writing Laboratory is available to anyone who may need assistance. Grammar, syntax, and spelling will account for 10% of the grade for written work.
5. I expect (and encourage) you to provide honest and timely feedback regarding the content and process of this course throughout the semester.
6. I expect you during the semester to interactively engage via Blackboard with the other students and the instructor.

7. I expect you to share in the responsibility for making this course an enjoyable and beneficial learning experience.
8. This is a graduate-level course that requires you to study at least 3 hours a week for one credit course like this one. You may need less time, but be prepared for the fact that some weeks may be busier than others.
9. I expect you to log into BB course homepage to access course announcement, course information, assignment submission, and communication with your fellow classmates.

### **Academic honesty**

Academic honesty is highly valued at the University. You must always submit work that represents your original words or ideas. If any words or ideas used in a class assignment submission do not represent your original words or ideas, you must cite all relevant sources and make clear the extent to which such sources were used. Words or ideas that require citation include, but are not limited to, all hard copy or electronic publications, whether copyrighted or not, and all verbal or visual communication when the content of such communication clearly originates from an identifiable sources. Per university policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the university, may be imposed. All incidents of cheating and plagiarism are taken very seriously at the University of Kentucky, and there are specific policies and procedures in place to prosecute them. See S.R. 6.3.0 (PDF) for the exact Senate Rules regarding academic offenses.

### **Accommodations**

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, submit to me a Letter of Accommodation from the Disability Resource Center. If you have not already done so, please register with the Disability Resource Center for coordination of campus disability services available to students with disabilities. Contact Jake Karnes via email at [jkarnes@email.uky.edu](mailto:jkarnes@email.uky.edu) or by telephone 859-257-2754. You may also visit the DRC website for information on how to register for services as a student with a disability:  
<http://www.uky.edu/StudentAffairs/DisabilityResourceCenter/>

### **Religious Observances**

Students will be given the opportunity to make up work (typically, exams or assignments) when students notify their instructor that religious observances prevent the student from completing assignments according to deadlines stated in this syllabus. Students must notify the course instructor **at least two weeks prior to such an absence** and propose how to make up the missed academic work.

### **Inclement weather**

The University of Kentucky has a detailed policy for decisions to close in inclement weather. This policy is described in detail at [http://www.uky.edu/PR/News/severe\\_weather.htm](http://www.uky.edu/PR/News/severe_weather.htm) or you can call (859) 257-1754.

### **Late work policy**

Late homework will not be accepted unless arranged with the instructor under extenuating circumstances as allowed by the excused absences policy.



### Excused absences policy

Attendance, excused absences and make-up opportunities for this course will conform to the course policies established by the Office of Academic Ombud Services as found at [www.uky.edu/Ombud/policies.php](http://www.uky.edu/Ombud/policies.php)

## COURSE SCHEDULE

- MIDTERM EXAM: Wednesday, 10/09/2014, 3-5.30pm, EST
- FINAL EXAM: Wednesday, 12/19/2014, 3-5.30pm, EST
- All assignments should be submitted by each assigned due date (normally Wed 11:59pm, EST).
- Supplementary readings will be posted as needed.

Date	Topic	Readings	Assignment Dues
08/28 Wed	-Introduction to the topics -Blackboard Features		<ul style="list-style-type: none"><li>• Course syllabus and Blackboard course homepage should be fully understood!</li></ul>
09/04 Wed	<b>(Lesson 1)</b> Introduction to advanced searching and retrieval in biomedical imaging informatics	IR chapter 1 and PVIR chapter 1	
09/11 Wed	<b>(Lesson 2)</b> Biomedical image retrieval using colors	PVIR chapter 2	
09/18 Wed	<b>(Lesson 3a)</b> Content based biomedical image searching and retrieval using texture	PVIR chapter 3 and instructor-prepared research articles	<ul style="list-style-type: none"><li>• Assignment #1: Feature extraction</li></ul>
09/25 Wed	<b>(Lesson 3b)</b> Content based biomedical image searching and retrieval using texture	PVIR chapter 3 and instructor-prepared research articles	
10/02 Wed	<b>(Lesson 4a)</b> Shape matching and its application for biomedical image searching and retrieval	PVIR chapter 4 and instructor-prepared research articles	
10/09 Wed	<b>(Midterm Exam)</b>		
10/16 Wed	<b>(Lesson 4b)</b> Shape matching and its application for biomedical image searching and retrieval	PVIR chapter 4 and instructor-prepared research articles	
10/23 Wed	<b>(Lesson 5)</b> Feature similarity and distance	PVIR chapter 5 and instructor-prepared research articles	<ul style="list-style-type: none"><li>• Assignment #2: Image searching using K-d tree</li></ul>
11/06 Wed	<b>(Lesson 6a)</b> Biomedical image feature selection and visual learning	PVIR chapter 6 and instructor-prepared research articles	
11/13 Wed	<b>(Lesson 6b)</b> Biomedical image feature selection and visual learning	PVIR chapter 6 and instructor-prepared research articles	

11/20 Wed	<b>(Lesson 7a)</b> Query language for biomedical image searching and retrieval.	IR chapter 8, PVIR chapter 8 and instructor-prepared research articles	<ul style="list-style-type: none"> <li>• Assignment #3: Relevance feedback</li> </ul>
11/27 Wed	<b>(Lesson 7b)</b> Query language for biomedical image searching and retrieval.	IR chapter 8, PVIR chapter 8 and instructor-prepared research articles	
12/04 Wed	<b>(Lesson 8)</b> Advanced topic in biomedical image searching and retrieval, such as bag of visual words model and relevance feedback.	PVIR chapter 9 and instructor-prepared research articles	
12/11 Wed	<b>(Lesson 9)</b> High performance computing using Cloud, Grid and Graphic Processing Unit (GPU)	Instructor-prepared research articles	
12/19 Wed	Final project demo and technical report		

**UNIVERSITY OF KENTUCKY  
COLLEGE OF PUBLIC HEALTH**

*Last modified: 2/05/2014*

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**Course Syllabus**  
**BMI 735 Introduction to Biolmage Informatics**  
**Fall 2014**  
**Distance Learning Offering through Blackboard**

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**Classroom and Meeting Hours**

Online course materials posting date: New materials are made available every Monday by 11:59pm, EST through Blackboard.

Online live sessions: During the semester, four three-hour online meetings will be conducted via UKY Adobe Connect facility during which students can ask questions about the course material or assessment (homework, assignments etc.). This is in addition to email and phone.

Face-to-face meetings are not scheduled for this course. Course materials (slides, recordings) can be viewed offline and all assessment is also conducted through Blackboard submissions.

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**Contact information**

- Instructor: Lin Yang, Assistant Professor of Division of Biomedical Informatics
- Web: <http://www.uky.edu/~lya227/>
- Office: 230D MDS
- Telephone: 859-218-2248
- E-mail: [lin.yang@uky.edu](mailto:lin.yang@uky.edu) (Preferred method of contact)  
(Maximum response time will be within 48 hours)
- Office Hours (Online/Offline): Wednesdays between 1PM – 3:00PM

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**Course description**

This class aims to give students an introduction of searching and retrieval in biomedical image analysis and imaging informatics. We will introduce some advanced biomedical image analysis, searching, and retrieval algorithm for fast and efficient image searching and retrieval. The topics in this class will include:

1. Advanced biomedical image analysis and pattern recognition
2. Machine learning in depth (Nonlinear dimension reduction, manifold learning, robust statistics, sparse representation, boosting, etc.)
3. Advanced Image informatics: searching algorithm such as k-d tree, relevance feedback, etc.
4. Content based image retrieval
5. Computer aided diagnosis.
6. High performance computing using Cloud, Grid and Graphic Processing Unit (GPU)
7. Selected topics in image searching and retrieval, such as bag of visual words model, etc.

**Course rationale:**

This class is suitable for a broad spectrum of students who taken Introduction to Biomedical Image Analysis and Imaging Informatics or have a solid background in statistics, mathematics, computer science, electrical and computer engineering, biomedical engineering, who are

interested in learning how to utilize informatics and computational tools to search and retrieve large image datasets (multiple dimensions, multiple modalities) in an efficient, fast, and high throughput manner.

### **Course prerequisites**

BMI-734: Introduction to Biomedical Image Analysis

### **Course objectives**

- Obtain advanced knowledge in biomedical image computing for processing biomedical images to extract quantitative and automatic measurements. Be able to publish high quality research papers in biomedical image analysis and imaging informatics areas.
- Apply the advanced tools and software for building high throughput imaging informatics system

### **Public Health Competencies for Statistics and Informatics**

- Apply basic informatics techniques with vital statistics and public health records in the description of public health characteristics and in public health research and evaluation.
- Appreciate the importance of working collaboratively with diverse communities and constituencies (e.g. researchers, practitioners, agencies and organizations).
- Discuss the influences of social, organizational and individual factors on the use of information technology by end users.
- Collaborate with communication and informatics specialists in the process of design, implementation, and evaluation of public health programs.
- Use information technology to access, evaluate, and interpret public health data.
- Use informatics methods and resources as strategic tools to promote public health.
- Use informatics and communication methods to advocate for community public health programs and policies.

### **College of Public Health Competencies- adopted from MPH Cross-cutting competencies, 2013**

- Organize and deliver effective written and verbal communications about public health activities using appropriate communication strategies to professionals, labor, industry, the general public and the media.
- Use evidence based principles and scientific knowledge effectively when involved in evaluation and decision-making in public health.
- Manage potential conflicts of interest encountered by practitioners, researchers, and organizations.
- Collaborate in inter-professional partnerships to implement organizational initiatives at the individual, organizational, and community level.

### **Student learning outcomes:**

Upon completion of this course, the learner will:

- be able to build a small scale imaging informatics system from scratch;
- be able to develop novel biomedical image analysis algorithm with an emphasis on the areas of interest to the translational and clinical research community
- be able to develop open source tools for radiology, pathology, and biology image processing, indexing, and retrieving,

- be able to understand biomedical image analysis, computer vision, pattern recognition and machine learning terminologies with the focus of biomedical knowledge transfer, be able to utilize the learned knowledge to solve practical research problems.

### **Textbooks**

No textbook is required for this class. Various readings from research articles will be assigned based on the content being covered. Most readings will be available online for free of charge for UK students and staff. Readings can be found in course calendar. Students must have access to a computer with Internet connection that meets the university standard. The lecture will provide research papers for reading and presentation in this advanced class.

### **Technology Requirements**

Since this is a distance-learning course, students are required to have stable access to a computer and hence encourage students to own a personal computer (laptop/desktop is okay but tablets are not sufficient) according to these requirements:

<http://www.uky.edu/ukit/hardwareguide>

Furthermore, to fully participate in the distance learning experience students are also required to install the following software and acquire useful hardware:

<http://www.uky.edu/DistanceLearning/current/technology/techReqs.html>

### **Course requirements and learner evaluation**

For those who take the class for credit, the following course assignments and midterm are required. Course grades will be based upon evaluation of the following activities:

Three Assignment and Midterm (50 points total)

- Assignment #1 (10 points): Feature extraction
- Assignment #2 (10 points): Image searching using K-d tree
- Assignment #3 (10 points): Relevance feedback
- Midterm (20 points): Close book midterm exam
- Final exam (50points) will be a competitive team project. Students will be separated into several groups to work on one specific problem. Each group will test their image searching and retrieval algorithm based on the other group's proposed testing data and instructor's testing images. Both the searching/retrieval speed and accuracy will be evaluated. The winning group will get extra credit to compensate for what was lost during exams. The winning group will also be awarded a certificate.

### **Grade Distribution:**

<i>Points</i>	<i>Letter grade</i>
100-90	A
89-80	B
79-70	C
0-69	E

### **Instructor expectations**

1. I expect you to submit papers using proper English grammar, syntax, and spelling. You are encouraged to use spell check and grammar check prior to submitting your written work.

The Writing Laboratory is available to anyone who may need assistance. Grammar, syntax, and spelling will account for 10% of the grade for written work.

2. I expect (and encourage) you to provide honest and timely feedback regarding the content and process of this course throughout the semester.
3. I expect you during the semester to interactively engage via Blackboard with the other students and the instructor.
4. I expect you to share in the responsibility for making this course an enjoyable and beneficial learning experience.
5. This is a graduate-level course that requires you to study at least 3 hours a week for one credit course like this one. You may need less time, but be prepared for the fact that some weeks may be busier than others.
6. I expect you to log into BB course homepage to access course announcement, course information, assignment submission, and communication with your fellow classmates.

### **Academic honesty**

Academic honesty is highly valued at the University. You must always submit work that represents your original words or ideas. If any words or ideas used in a class assignment submission do not represent your original words or ideas, you must cite all relevant sources and make clear the extent to which such sources were used. Words or ideas that require citation include, but are not limited to, all hard copy or electronic publications, whether copyrighted or not, and all verbal or visual communication when the content of such communication clearly originates from an identifiable sources. Per university policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the university, may be imposed. All incidents of cheating and plagiarism are taken very seriously at the University of Kentucky, and there are specific policies and procedures in place to prosecute them. See S.R. 6.3.0 (PDF) for the exact Senate Rules regarding academic offenses.

### **Accommodations**

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, submit to me a Letter of Accommodation from the Disability Resource Center. If you have not already done so, please register with the Disability Resource Center for coordination of campus disability services available to students with disabilities. Contact Jake Karnes via email at [jkarnes@email.uky.edu](mailto:jkarnes@email.uky.edu) or by telephone 859-257-2754. You may also visit the DRC website for information on how to register for services as a student with a disability: <http://www.uky.edu/StudentAffairs/DisabilityResourceCenter/>

### **Religious Observances**

Students will be given the opportunity to make up work (typically, exams or assignments) when students notify their instructor that religious observances prevent the student from completing assignments according to deadlines stated in this syllabus. Students must notify the course instructor **at least two weeks prior to such an absence** and propose how to make up the missed academic work.

### **Inclement weather**

The University of Kentucky has a detailed policy for decisions to close in inclement weather. This policy is described in detail at [http://www.uky.edu/PR/News/severe\\_weather.htm](http://www.uky.edu/PR/News/severe_weather.htm) or you can call (859) 257-1754.

### **Late work policy**

Assignments that are turned in late will be marked one letter grade lower unless prior approval from the instructor has been obtained. It will be based on the time stamp provided by Blackboard. (NOTE: Assignments more than one week past the original due date will not be graded.)

### **Excused absences policy**

Attendance, excused absences and make-up opportunities for this course will conform to the course policies established by the Office of Academic Ombud Services as found at [www.uky.edu/Ombud/policies.php](http://www.uky.edu/Ombud/policies.php)

### **Technical Requirements** (Adopted from Distance Learning Recommendation)

The preferred method for reaching instructor is through emails, however, both physical and virtual office hours are also maintained by the instructor.

"In order to have a successful educational experience in distance learning courses, there are minimum technology requirements that should be met. The University of Kentucky strongly recommends that each student purchase a personal computer. To review minimum recommendations and guidelines for your computer click here.

University of Kentucky distance learning students are also encouraged to acquire the following hardware, software, and Internet connection to ensure that all systems used by distance learning courses will function properly."

Go to the link at: <http://www.uky.edu/DistanceLearning/current/technology/techReqs.html> to test your network speed and other necessarily technology requirements for this class.

### **Information on Distance Learning Library Services**

Available at: <http://libraries.uky.edu/dlls>

Carla Cantagallo, DL Librarian, (859) 218-1240

Email: [dllservice@email.uky.edu](mailto:dllservice@email.uky.edu)

DL Interlibrary Loan Service: [http://libraries.uky.edu/page.php?lweb\\_id=253](http://libraries.uky.edu/page.php?lweb_id=253)

### **Contact information for:**

TASC <http://www.uky.edu/ukit/atg/tasc>

Information Technology Customer Service Center <http://www.uky.edu/ukit/>

### **Technical Issues**

Students should contact the instructor (via email) and the UKIT help desk in case they are unable to access the materials (<http://www.uky.edu/UKIT>, 859-218-HELP) so that issues can be resolved in a timely fashion and homeworks can be submitted on time.

## COURSE SCHEDULE

- Posting dates for course materials: Every Wednesdays by 11:59pm, EST.
- MIDTERM EXAM: Wednesday, 10/09/2014, 3-5.30pm, EST through Blackboard
- FINAL EXAM: Wednesday, 12/19/2014, 3-5.30pm, EST through Blackboard
- Exam links will be made available during the exam timeframe on the designated dates.
- All assignments should be submitted by each assigned due date (normally Wed 11:59pm, EST) via Blackboard assignment link.
- Supplementary readings will be posted on the Blackboard, as needed.

Date	Topic	Readings	Assignment Dues
08/28 Wed	-Introduction to the topics -Blackboard Features		<ul style="list-style-type: none"> <li>• Course syllabus and Blackboard course homepage should be fully understood!</li> </ul>
09/04 Wed	<b>(Lesson 1)</b> Introduction to advanced searching and retrieval in biomedical imaging informatics	IR chapter 1 and PVIR chapter 1	
09/11 Wed	<b>(Lesson 2)</b> Biomedical image retrieval using colors	PVIR chapter 2	
09/18 Wed	<b>(Lesson 3a)</b> Content based biomedical image searching and retrieval using texture	PVIR chapter 3 and instructor-prepared research articles	<ul style="list-style-type: none"> <li>• Assignment #1: Feature extraction</li> </ul>
09/25 Wed	<b>(Lesson 3b)</b> Content based biomedical image searching and retrieval using texture	PVIR chapter 3 and instructor-prepared research articles	
10/02 Wed	<b>(Lesson 4a)</b> Shape matching and its application for biomedical image searching and retrieval	PVIR chapter 4 and instructor-prepared research articles	
10/09 Wed	<b>(Midterm Exam)</b>		
10/16 Wed	<b>(Lesson 4b)</b> Shape matching and its application for biomedical image searching and retrieval	PVIR chapter 4 and instructor-prepared research articles	
10/23 Wed	<b>(Lesson 5)</b> Feature similarity and distance	PVIR chapter 5 and instructor-prepared research articles	<ul style="list-style-type: none"> <li>• Assignment #2: Image searching using K-d tree</li> </ul>
11/06 Wed	<b>(Lesson 6a)</b> Biomedical image feature selection and visual learning	PVIR chapter 6 and instructor-prepared research articles	
11/13 Wed	<b>(Lesson 6b)</b> Biomedical image feature selection and visual learning	PVIR chapter 6 and instructor-prepared research articles	
11/20 Wed	<b>(Lesson 7a)</b> Query language for biomedical image searching and retrieval.	IR chapter 8, PVIR chapter 8 and instructor-prepared research articles	<ul style="list-style-type: none"> <li>• Assignment #3: Relevance feedback</li> </ul>
11/27 Wed	<b>(Lesson 7b)</b> Query language for biomedical	IR chapter 8, PVIR chapter 8 and	



	image searching and retrieval.	instructor-prepared research articles	
12/04 Wed	<b>(Lesson 8)</b> Advanced topic in biomedical image searching and retrieval, such as bag of visual words model and relevance feedback.	PVIR chapter 9 and instructor-prepared research articles	
12/11 Wed	<b>(Lesson 9)</b> High performance computing using Cloud, Grid and Graphic Processing Unit (GPU)	Instructor-prepared research articles	
12/19 Wed	Final project demo and technical report		



Center for Clinical and  
Translational Science (CCTS)

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May 29, 2014

Stephen W. Wyatt, DMD, MPH  
Dean  
College of Public Health  
111 Washington Avenue, Room 112  
CAMPUS 0003

Dear Dean Wyatt:

The NIH CTSA program places great value on biomedical informatics research and training programs. For CTSA's, from a training perspective, informatics, bioinformatics and clinical/informatics content and courses for professional and academic doctoral, as well as professional and academic masters students are major priorities. Every aspect of the health sciences, from basic research, to clinical care to community based outcomes studies, will continue to be dependent on the analysis of data and the translation of data into information, and thus it is critically important that we train the next generation of clinicians and researchers in informatics. The UK Center for Clinical and Translational Science (CCTS), as part of the NIH CTSA network, has been building courses for students on our campus. The proposed courses are part of the CCTS plan to build toward an academic degree offering in biomedical informatics. In addition, the courses will also be available to professional doctoral students in Medicine and Pharmacy, and will be available for inclusion in certificate programs on our campus. These courses have potential beyond our campus; Medical schools at Marshall University, East Tennessee State University and the University of Pikeville are exploring arrangements to access these courses for their students.

As the CCTS prepares for its next grant submission in 2015-2016, these courses are an important and strategic priority.

Sincerely,

A handwritten signature in black ink, appearing to read 'Phillip A. Kern'.

Phillip A. Kern, M.D.  
Professor of Medicine, Division of Endocrinology  
Director, Center for Clinical and Translational Sciences  
Associate Provost for Clinical and Translational Science  
Director, Barnstable Brown Diabetes and Obesity Center



June 6, 2014

Stephen W. Wyatt, DMD, MPH  
Dean  
College of Public Health  
111 Washington Avenue, Room 112  
CAMPUS 0003

Dear Dean Wyatt:

As you know, the PhD program in Epidemiology and Biostatistics is intended to be an integrative doctoral program which prepares future researchers who will have substantial quantitative preparation in the unique domains of these two disciplines. The essentially strong cross-training and mentoring nature of the program is intended to develop independent researchers skilled in designing and conducting studies, as well as analyzing and interpreting the results from an increasing variety of study designs.

As the current Chair of Academic Affairs, I recently reviewed the large complement of courses in bioinformatics, clinical informatics, information retrieval, and natural language processes that have been developed by our faculty in the Division of Bioinformatics. Many of these courses may be suitable electives for our doctoral students. As you are aware, there has been an intense demand for scientifically trained (subject matter) data analysts who can address the issues in conducting studies which include large amounts of complex data.

For epidemiologists and biostatisticians working in human genome epidemiology, statistical genetics, and related disciplines, the field will require a better understanding of the management and retrieval of information from these large datasets. Training in biomedical informatics will be appealing to some of our PhD students in Epidemiology and Biostatistics and will be encouraged by many of our program faculty.

Sincerely,

A handwritten signature in black ink that reads "STEVE BROWNING". The signature is written in a cursive style with a horizontal line underneath the name.

Steven R. Browning, PhD  
Associate Professor, Director of Graduate Studies for the PhD  
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June 6, 2014

Stephen W. Wyatt, DMD, MPH  
Dean  
College of Public Health  
111 Washington Avenue, Room 112  
CAMPUS 0003

Dear Dean Wyatt:

I am writing to offer my enthusiastic support for the new biomedical informatics courses that are being proposed to the Graduate Council. As you know, the Master of Science program in Clinical Research Design is intended to prepare practicing health care professionals and students pursuing a terminal degree (MD, PharmD, etc.) to conduct population based research. The program is targeted to students who wish to enhance their translational research skills and increase their knowledge of population-based health and clinical trials. MDs interested in an academic appointment will find that this degree program will make them competitive for the best positions, where research skills are becoming the norm. Of particular demand for medical researchers are effective uses of biomedical data, information, and knowledge for scientific inquiry, problem solving and decision-making motivated by efforts to improve human health.

Our MS program is designed to accommodate graduates of the Certificate in Clinical Research Skills offered in conjunction with the Center for Clinical and Translational Sciences, which strongly emphasizes and relies on biomedical informatics. The addition of these courses to the list of electives that Clinical Research Design students can choose will be extremely attractive to current students, and may perhaps entice prospective students to pursue the Graduate Certificate or degree program. The faculty proposing and teaching these courses are great partners in education and research and I look forward to strengthening existing ties through implementation of these courses. For these reasons, as Director of Graduate Studies for the MS program in Clinical Research Design, I fully support these new course proposals.

Sincerely,

David M. Mannino, M.D.  
Professor and Chair  
Department of Preventive Medicine and Environmental Health  
Director of Graduate Studies, Masters of Science in Clinical Research Design  
University of Kentucky College of Public Health

Department of Pulmonary, Critical Care, and Sleep Medicine  
University of Kentucky College of Medicine

**Perkins, Andrea L**

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**To:** Mirosław Truszczyński  
**Subject:** RE: Support for BMI courses

**From:** [mirektruszczyński@gmail.com](mailto:mirektruszczyński@gmail.com) [mailto:mirektruszczyński@gmail.com] **On Behalf Of** Mirosław Truszczyński  
**Sent:** Wednesday, July 16, 2014 9:46 AM  
**To:** Perkins, Andrea L  
**Cc:** Nagarajan, Radha; KIM, SUJIN; Wray, Johanna (JoJo)  
**Subject:** Re: Support for BMI courses

I reviewed the proposals for the new biomedical courses BMI 633, 730-735. I find them useful to candidates for the Informatics Certificate, pursued typically by 2-4 students per year.

I support their approval.

Mirek Truszczyński  
Director, Informatics Certificate