

SPRING 2011
Linguistic Geometry
CSC 4630/5630

General Information

Instructor: Professor Boris Stilman
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Office hours: Schedule an appointment by email
Monday, 10:45 am – 12:45 pm
Wednesday, 10:45 am – 11:45 pm
I am also available early mornings Mon & Wed before classes:
6:30 am – 7:30 am.

Class meetings: Monday and Wednesday, 8:00 am – 9:15 am, Room NC 1315

Catalog Data

Linguistic Geometry (LG) is a new type of game theory in Artificial Intelligence for solving abstract board games (ABG). LG is a generalization of the human methodology of handling conflicts (usually through fighting) that was developed unconsciously long before any civilizations appeared on Earth. Then, it was perfected over several thousand years of wars all around the world. About 1.5 thousand years ago people invented the game of chess trying to model ancient armed conflicts. It is fascinating that the theory of conflicts was discovered via generalization of the experiments with Chess Grandmasters. Over the last 10 years LG was successfully applied to command and control of a wide spectrum of military operations in the USA and abroad. Its applications are currently considered vital to the US National Defense.

Textbooks

B. Stilman, "Linguistic Geometry: From Search to Construction", Kluwer Academic Publishers, 2000. Lecture Notes (pdf files) will appear on *my* web site after each class: download, read, and print.

Course Objectives

Study of the key concepts of LG required for understanding of the current results, market applications, ongoing research, and future developments. The emphasis is on 11 problem-solving assignments and 5 software projects of gradually increased complexity. Undergraduate students will receive special treatment with homeworks and grading.

Course Topics

Topics include construction of abstract board games, controlled grammars, grammars of trajectories and zones, translations, LG-searches, no-search approach, various applications.

Preliminary Course Outline*

Lecture	Date	Topic	Reading	Assignments, Projects
1	01.19	History of LG		
2	01.24	Intro to LG: ABG	Ch. 1, 3	1, Project 1
3	01.26	Reachability, MAP15	Ch. 2	
4	01.31	Grammars	Ch. 8	2
5	02.02	Induction	Ch. 8	
6	02.07	Shortest Trajectories	Ch. 9	3, Project 2
7	02.09	Admissible Trajectories	Ch. 9	
8	02.14	Zones Definition	Ch. 10	4
9	02.16	Zones Grammar 1		
10	02.21	Zones Grammar 2		5, Project 3
11	02.23	Zones Completion		

12	02.28	Second Negation		6
13	03.02	Theorem about Zones	Ch. 10	
14	03.07	Motion	Ch. 11	7
15	03.09	Translations (Theorem)		
16	03.14	Power Maintenance		
17	03.16	Midterm Review		
18-19	03.19 Sat	Midterm Exam (3h)		
	03.22-26	Spring Break		
20	03.28	Search	Ch. 12	8, Project 4
21	03.30	Grammar of Searches	Ch. 12	
22	04.04	Reti Robots 2D/3D	Ch. 3, 4	9
23	04.06	Concurrent Reti	Ch. 6	
24	04.11	State Space Chart	Ch. 13	10, Project 5
25	04.13	Construction		
26	04.18	Nadareishvili	Ch. 5	
27	04.20	Capablanca	Notes	
28	04.25	Resource Allocation		11
29	04.27	Final Review		
30-31	04.30 Sat	Final Exam (3h)		

*) Course Outline is a preliminary document, which can be adjusted during the semester in response to student performance, scheduling changes, unanticipated events.

Prerequisites

No formal prerequisites.

Grading Policy

Homework	Weekly Assignments & Projects	40%
Exams	Midterm & Final Exams (30% each)	60%

Submission of assignments and projects after the due date is allowed with 10% grade reduction. Also, multiple resubmissions are allowed. This is the way to learn and improve your grade up to the maximum (if the first submission was on time). Don't postpone submissions. It will be difficult to skip assignments and later make up, because, usually, every next assignment is based on the previous one. Your debt may grow faster and be scarier than the credit card debt.

CSE Policy on Cheating

Issues related to academic dishonesty policy are considered on the CS departmental web site. The penalty for cheating -- wherever or whenever the cheating is determined to have occurred -- is failure of the course.

Homework Guidelines

Fully read problem statements and answer each element of the problem. Most homework problems ask short open-ended questions about, for instance, search algorithm behavior for particular problems or datasets. Such questions are for students curious inquiry, though they must also be addressed substantively in narrative form in the homework. In general, mathematical, diagrammatic or graphic, and narrative descriptions should be used in concert as much as necessary to convey understanding of the material (or apparent issues where clear-cut answer is difficult). Quality is expected in terms of content and clarity of presentation. Some homework questions require only short succinct answers, but generally require clear supporting reasoning (system or algorithm behavior are often topics under discussion). For example, there is no standard state representation for the various problems under examination, but those shown by students should be clearly notated with adequate description; each representation of a single state must have sufficient information

(formal terms) to fully describe that state without review of the state history.

Due to legibility concerns, the only mode for submission is **typed work**. You can do this employing MS Word or other graphing program and paste it in Word. Note that all the drawings in the course handouts are made in Word. Notations should unambiguously refer to elements in the system under examination via labels (e.g., circled capital letters). Such annotation labels should clearly be notationally separate from state variables, i.e., those describing a state in a state diagram or tree.

The programming language for programming assignments is of your choice. Every submitted program must be documented properly with program text (with comments), sample inputs and outputs, and it must be executable.

Submissions should be made by email only to

Boris.Stilman@UCDenver.edu.

No paperwork will be accepted. Every submission must have the following text in the email subject:

**LG Homework XX lastname mm/dd/yyyy/ or
LG Project Y lastname mm/dd/yyyy/**

XX is the double-digit assignment number from 01 to 12, **Y** is the project number from 1 to 5, which you are submitting or resubmitting, **lastname** is your last name, **mm/dd/yyyy** is the today's date. For example, **LG Homework 07 Dow 02/01/2010**. Projects and homeworks should be submitted by separate emails. Submission of several homeworks should be done via several messages, one homework per message. Graded homework will be emailed to the address that you provided or the address from which this homework was sent. Multiple submissions of homeworks and projects are accepted so short narrative description of **corrected portions** is required.

**UC Denver – Downtown
Dates and Deadlines*
ACADEMIC CALENDAR
Spring 2011**

Students are accountable for knowing and following these deadlines.
Students **must** use and regularly check their [UC Denver assigned e-mail address](#);
University communication will be sent to your UC Denver assigned **e-mail address**.

- November 8 - **First day to register**, check [UCDAccess](#) for your registration date and time. Before registration, all students must pay a **\$200 registration advance payment** which will be applied to your tuition and fees. See billing information below.
- **First day to apply for Spring graduation. (Tentative)**
See your advisor.
- January 17 - Martin Luther King Holiday. No classes; campus open.
- January 17 BY 5:00 PM - **Last day to withdraw from all classes and receive refund of \$200 advance payment and no tuition assessed.**
- January 18 - First day of Spring semester classes.
- First day faculty/staff may register with a tuition waiver.
- Last day to petition for resident tuition status.
- January 23 **LAST DAY TO:**
- **Add courses and waitlist using [UCDAccess](#)**
- If you are on the waitlist, [read waitlist "How to"](#)
- NOTE: if your course does not appear as "enrolled" on your schedule by Census Date, you are not enrolled in the course.
- January 24 - **No adds permitted today.**
- **Last day to drop a course without a \$100 drop charge.**
- January 25 - First day instructor may approve a request to add a student to a closed course using a [Schedule Adjustment Form](#).
- January 25 **Between January 25 and February 2:**
- Courses may be added using a [Schedule Adjustment Form](#) with instructor's approval and signature.
- Independent study, internship, thesis, and dissertation credit may be added with required signature approvals using a [Special Processing Form](#).
- Late starting module or intensive courses may be added up until the first day of the class. After that, those courses may be **added with instructor's approval and signature**.
- February 2 **CENSUS DATE**
By 5:00 PM **LAST DAY TO:**
- **DROP** full-term courses (with financial adjustment).
- After this date, dropped courses **require instructor's approval/signature**; *courses appear* on your transcript.
- **Withdraw from the term.**
After this date, complete withdrawal (all courses dropped) requires the signature of your dean (no tuition adjustment). Signature of financial aid required if student has financial aid (loans, grants, or scholarships).
- **ADD** full term courses (except thesis, independent study and internships). **After this date**, student will be charged the **full tuition amount** for additional course(s) added - College Opportunity Fund hours will not be deducted from eligible student's lifetime hours.
- Request a No Credit or pass/fail grade for a course.
- Register as candidate for degree.
- **Last day to apply for spring graduation. (Tentative)**
- Petition for reduction in dissertation hours.
- **Submit faculty/staff tuition waiver forms.**
- March 21-27 - Spring break. No classes; campus open.
- April 4 - First day Registrar's Office **requires** dean's signature to drop or withdraw. NOTE: your college may require dean's approval prior to this date; please see your advisor.
- May 1 - **Last day to authorize for College Opportunity Fund (COF) via [UCDAccess](#)**. Students may continue to authorize through finals at the Registrar's Office.
- May 9-14 - Finals Week.
- May 14 - End of semester. Commencement.
- May 25 - Fall Final grades available on [UCDAccess](#) (tentative).
- June 15 - Degrees posted on [UCDAccess](#) (tentative).

MAIN CAMPUS AND EXTENDED STUDIES

Intensive courses are short format (less than five weeks). They require the same number of classroom hours, and the same amount of work as a full-term class, per credit.

Module courses are classes lasting five or more weeks but less than the full term. They require the same number of classroom hours, and the same amount of work as full-term courses. Module courses meet:

First five weeks:	January 18 – February 19
Second five weeks:	February 21 – March 25
Third five weeks:	March 28 – April 29

Instructor approval required to add class begins the first day of class. Instructor approval not required to drop the class within the first 15% of class meetings. **After that time, instructor approval is required.**

ACADEMIC CALENDAR 2011

Summer 2011 (tentative)

Memorial Day Holiday-Campus closedMay 30
Classes Begin..... June 6
Independence Day Holiday – No classes; campus closed.....July 4
End of term..... July 30

Fall 2011 (tentative)

Classes Begin..... August 22
Labor Day Holiday – No Classes; campus closed..... September 5
Fall Break – No Classes; campus open Nov 21-25
Thanksgiving Day Holiday – No Classes; campus closed Nov 24
End of term..... Dec 17

BILLING INFORMATION

(Check UC Denver Portal for your current account balance)

- **Please be aware there is a required [registration advance payment of \\$200.00](#).** This payment must be made before you can register. The ONLY exception to this requirement is if the Financial Aid Office has received your FAFSA data and you have completed the University Application for Financial Aid.
- 1st day of the term through the following Monday – If the student withdraws from all classes for the term, he/she will forfeit \$200, which corresponds to the \$200 registration advance payment.
- Beginning the second Tuesday of the fall and spring terms until census date. If a student drops a course, a \$100 drop charge will be assessed. If a student withdraws during this time frame (therefore dropping all classes), all tuition and other fees will be removed, but a drop charge of \$100 will be assessed for each course.

STUDENTS ARE RESPONSIBLE FOR COMPLYING WITH TUITION/FEE DEADLINES. UNPAID TUITION WILL BE SUBJECT TO 1.75% SERVICE CHARGE. ADDITIONALLY, PAST DUE ACCOUNTS MAY BE ASSESSED A 20% INTERNAL COLLECTION FEE ON THE UNPAID BALANCE FOR DETAILED INFORMATION ON PAYMENT DATES AND POLICIES, CALL 303-556-2710 or visit [Student Billing](#)

The University of Colorado Denver has implemented an official **E-Bill** (electronic billing) program. Beginning with the Fall 2008 Term, UC Denver no longer mails paper billing statements to students. All registered students must access their student account bill through the UC Denver Portal.

* Extended Studies/Continuing and Professional Education student Dates & Deadlines may vary – see your advisor.