Handbook for Students in

Applied Statistics

Department of Human Development
Teachers College, Columbia University

2020-2021

Welcome to Applied Statistics

Welcome to the MSAS program. As an *applied* statistics program, we emphasize the development of skills in a strong foundation in statistical theory, as well as:

- Statistical modeling;
- Statistical communication; and
- Statistical computing.

To this end, our courses typically include the mastery of methods, software, and writing – with many courses ending in projects.

Program Faculty

Our program includes 6 core faculty members:

- Professor James Corter
- Professor Lawrence DeCarlo
- Professor Bryan Keller
- Professor Young-Sun Lee
- Lecturer Dobrin Marchev
- Lecturer Thanos Patelis

As a new student, you should get acquainted with these faculty members' websites and specializations.

Master of Science (32 points)

The following courses are required (18 points):
HUDM 4125 Statistical inference (3)
HUDM 5126 Linear models and regression analysis (3)*
HUDM 6026 Computational statistics (3)
HUDM 5150 Statistical Careers, Communication, and Capstone (3)**

+ at least one of
HUDM 5123 Linear models and experimental design (3)
HUDM 6030 Multilevel and longitudinal data analysis (3)

+ and at least one of
HUDM 6055 Latent structure analysis (3)
HUDM 6122 Multivariate analysis (3)

*Under special circumstances HUDM 5122 may be substituted for HUDM 5126; advisor approval is required.
**This should be taken in the last Fall semester of study. This course includes completion of a culminating project.

Students must select 3 approved statistics electives (9 – 10 points). Options include:
- Other statistics courses in HUDM (e.g., HUDM 5123, 6030, 6055, 6122, 5124, 5130, 5133, 5124)
- Courses from around TC and CU that are approved (see list that follows in this document).

Students must complete the Breadth Requirement (6 points):
At least 2 courses must be taken at Teachers College from outside HUDM. Examples include:
- Courses on probability or other mathematics (MST program)
- Courses on evaluation (ORL)
- Courses on policy or economics (EPSA)

Suggested Concentrations

In the program, students have 3 statistics electives and 2 breadth courses that they can select based upon their own interests. While students are free to select from a wide range of courses, we suggest that students select (or create) a concentration. Below we offer sample concentrations.

<table>
<tr>
<td>Concentration: Education Policy
Required Courses:
HUDM 4125, 6026, 5126, 5150
HUDM 6030 Multi-level models
HUDM 6122 Multivariate

Statistics Electives:
HUDM 5133 Causal Inference
HUDM 5130 Meta-analysis
EDPS 5646 Evaluation of Education and Social Programs

Breadth: 2 courses in EPSA. Examples include:
EDPA 4899 Federal Policy Institute
EDPA 6027 International Perspectives Early Childhood Policy
EDPS 4000 Education and Public Policy
EDPE 4051 Education and Economic Development
EDPE 4055 Resource Allocation in Education</td>
<td>Concentration: Health
Required Courses:
HUDM 4125, 6026, 5126, 5150
HUDM 6030 Multi-level models
HUDM 6122 Multivariate

Statistics Electives:
HUDM 5133 Causal Inference
HUDM 5130 Meta-analysis
P8120 Analysis of categorical data (Mailman Biostatistics)

Breadth: 2 courses in BBS or HBS, for example:
HBSS 4102 Principles of Epidemiology
HBSS 5110 Determinants of Health Behavior
HBSV 4000 Intro to Nutrition
HBSV 4010 Food, Nutrition, and Behavior
BBS 5068 Brain and Behavior</td>
</tr>
<tr>
<td colspan="2">Concentration: Psychology
Required Courses:
HUDM 4125, 6026, 5126, 5150
HUDM 5123 Linear Models and Experimental Design
HUDM 6122 Multivariate

Statistics Electives:
HUDM 5133 Causal Inference
HUDM 6030 Multilevel Models
HUDM 6055 Latent Structures/ SEM

Breadth: Any 2 courses in HUD, or elsewhere, for example:
ORL 5524 Instrument Design and Validation
HUDK 4029 Cognition and Learning</td>
</tr>
</table>

Full-time MSAS Program

Students can apply for and be admitted to the full-time program in the fall semester only. This program takes up to 3 semesters of study.

Suggested Course Sequence

Fall	Spring	Fall
HUDM 4125 (req)	HUDM 6026 (req)	HUDM 5150 (req)
HUDM 5126 (req)	HUDM 6122* or HUDM 6030**	HUDM 5123** or HUDM 6055*
HUDM 5026	Stat elective	Breadth
Breadth	Stat elective	<See below>

* Choose one; ** Choose one. (You must take *at least* one of each).

For International Students on Visas:

- Each semester you need to maintain 12 points for full time status.
- In your last semester, you will need a "Reduced Course load" form signed by the Program Director. Expect an email.

For all students:

- In your last semester, you will need to submit an "Intent to Graduate" form early in the semester.

"En Passant" MSAS Program
(for PhD/EdD students)

Students in doctoral programs at Teachers College are encouraged to complete the MSAS degree along the way.

College Policies:

- For doctoral students, courses can "double-count" from the doctoral degree and MSAS degree. This means that at most, the MSAS degree is 9 classes (27 points).
- Students must at some point *transfer* out of their doctoral program *into* the MSAS program for *two semesters*. These do not have to be contiguous. Summer terms can count towards this requirement. (Interested students should not let this issue keep them from completing the degree.)
- In order to complete the MSAS degree, students must be admitted to the MSAS program. To do so, a "Change of program" form is required, signed by the Program Director.
- It *is* possible to complete the doctoral degree first, and then return to complete the MSAS later.

"Typical" Student Process:

The typical En Passant MSAS student completes 5 HUDM courses (e.g., 5122, 6122, 6055, 5123, 6030) before transferring into the degree. The remaining courses are completed over Fall / Spring semesters (though these do not have to be the semesters counted towards the residency requirement above). These remaining courses involve statistical theory, advanced programming skills in R, and a culminating project.

The coursework in these semesters typically looks as follows:

(Last) Fall	(Last) Spring
HUDM 4125	HUDM 6026
MST 4046 (Math for Behavioral Sciences)	
HUDM 5150 (Capstone)	

Students interested in the MSAS are encouraged to meet with the Program Director as soon as possible and to check in with the Program Secretary to ensure that they are added to email lists, etc for advising. **This is important since the Program Director will not know the student is completing the degree otherwise.**

Program Policies

Incomplete Policy for HUDM Courses

In HUDM courses, the grade of Incomplete must be discussed and agreed upon with the instructor before the end of the semester. Typically, Incompletes are given when a student has attended the course and completed most assignments (including midterm and homework), but needs extra time for projects or assignments towards the end of the semester due to documented medical or family emergencies. In these cases, the remaining assignments or exams are **typically completed within 3-4 weeks of the end of the semester**. In rare cases, a student who has completed all assignments and participated during the first half of the semester but has experienced a documented family or medical emergency can also take an Incomplete. In these cases, the course should be retaken in its entirety within 12 months. Incompletes are not typically given for students who miss exams without prior approval, do not have adequate documentation, or who have not completed most assignments and exams. Please see the College grades policy here: http://www.tc.columbia.edu/policylibrary/associate-provost-enrollment-services/grading-/ .

Pass/Fail Policy for HUDM Courses

According to college policy, the grades of A to C are considered "passing" grades (a P when taken Pass/Fail). Grades C- to F (a F when taken Pass/Fail) are considered "very low performance" and may not count towards graduation requirements (i.e., only one 3-point C- can count towards a degree). **In order to pass an HUDM course**, a student must complete most required homework assignments with satisfactory performance AND have a passing average on exams and/or projects. Although formal attendance requirements vary from faculty member to faculty member and class to class, students are expected to attend all classes for which they are registered and are responsible for absences incurred by late enrollment. Each instructor will state their grading scale at the beginning of the semester, and students should consult these guidelines carefully.

Satisfactory Progress in MSAS Program Policy

Under College policy, no more than 3 points of C- may be credited toward any degree, certificate or diploma. Students who accumulate 8 points or more with grades of C- or lower may not continue study at the College and will not receive a degree or diploma. The College also has a policy on Satisfactory Academic Progress (SAP), available at http://www.tc.columbia.edu/admissions/financial-aid/sap-policy/, which spells out the academic standards necessary to maintain eligibility for federal financial aid.
In addition to College policies, the MSAS program requires that students pass (with grades of A through C) all 6 required courses (i.e., HUDM 4125, 5126, 6026, 6122/6055, 6030/5123, 5150). A grade of C- or below in any of these core courses results in dismissal from the program. For statistics elective courses and breadth courses the College policy applies.

HUDM Courses Approved for MSAS

Not all courses are offered each term. Check the schedule of classes for each term for current offerings. *These are the approved courses for the MSAS degree.*

HUDM 4125 Statistical Inference Prerequisite: Course in calculus. A calculus-based introduction to mathematical statistics. Topics include an introduction to calculus-based probability; continuous and discreet distributions; point estimation; method of moments and maximum likelihood estimation; properties of estimators including bias and mean square error; large-sample properties of estimators; hypothesis testing including the likelihood ratio test; and interval estimation.

HUDM 5026 Introduction to Data Analysis and Graphics in R (Summer) This course provides an introduction to the R language and environment for statistical computing with an emphasis on the application of fundamental graphical and statistical techniques. While some theory will be presented (for example, when discussing regression models), the focus will be on implementation and interpretation as opposed to study of the statistical properties of the methods.

HUDM 5058 Choice and Decision Making Prerequisite: HUDM 4122 or equivalent. Surveys quantitative models of individual decision making, from the introduction of the notion of "utility" by Daniel Bernoulli through current models such as Tversky and Kahneman's "Prospect Theory." The focus is on psychological or descriptive models of how people make decisions, although methods of rational decision analysis are briefly discussed.

HUDM 5059 Psychological Measurement Open to doctoral and Ed.M. students in psychology; others only by permission. A previous course in statistics or measurement is recommended. An in-depth examination of measurement and associated techniques, norms, classical test theory, reliability, validity, item response theory, issues, and applications.

HUDM 5122 Applied Regression Analysis Prerequisite: HUDM 4122 or permission of instructor. Least squares estimation theory. Traditional simple and multiple regression models and polynomial regression models, with grouping variables including one-way ANOVA, two-way ANOVA, and analysis of covariance. Lab devoted to applications of SPSS regression program. Lab fee: $50.

HUDM 5123 Linear Models and Experimental Design Prerequisite: HUDM 5122. Analysis of variance models including within subject designs, mixed models, blocking, Latin Square, path analysis, and models with categorical dependent variables. Lab devoted to computer applications. Lab fee: $50.

HUDM 5124 Multidimensional Scaling and Clustering Permission required. Prerequisites: HUDM 4122 and HUDM 5122 or equivalent. Methods of analyzing proximity data (similarities, correlations, etc.), including multidimensional scaling, which represents similarities among items by plotting the items into a geometric space, and cluster analysis for grouping items.

HUDM 5126 Linear Models and Regression Analysis Permission required. Prerequisites: HUDM 4125. An introduction to the theory and application of linear regression using calculus

and matrix algebra. The course focuses on multiple regression models including dummy variables and polynomial models, regression diagnostics, and advanced methods such as weighted least squares, multilevel models, and an introduction to the generalized linear model.

HUDM 5133 Causal Inference for Program Evaluation Prerequisite: HUDM 5122. Statistical and practical introduction to causal inference methods for program evaluation. Topics include validity; counterfactual model; randomized experiments; data analysis using non-equivalent control group designs based on the propensity score; instrumental variables; regression discontinuity; and regression in the context of causal inference.

HUDM 5250 Research Practicum in Measurement and Evaluation Permission required. Students enrolled are expected to spend a semester involved in a research project, either assisting a faculty member or in an applied setting. A formal report will be submitted.

HUDM 6026 Computational Statistics Prerequisite: HUDM 5123 or equivalent. Examines problems involved in preparing and analyzing large data sets. Includes a survey of data manipulation and statistical tools in SAS (Statistical Analysis System). Optional topics: introduction to numerical methods and survey of "data mining" tools.

HUDM 6030 Multilevel Longitudinal Data Analysis Prerequisite: HUDM 5122. Multilevel models include a broad range of models called by various names, such as random effects models, multi-level models, and growth curve models. This course introduces the background and computer skills needed to understand and utilize these models.

HUDM 6051 Intermediate Measurement Permission required. Prerequisites: HUDM 5059, HUDM 5122, or equivalents. Psychometric theory underlying test construction; classical test theory, item response theory, and applications.

HUDM 6052 Psychometric Theory II Permission required. Prerequisites: HUDM 5059, HUDM 5122, or equivalents. Psychometric theory underlying test construction; classical test theory, item response theory, and applications.

HUDM 6055 Latent Structure Analysis Permission required. Prerequisite: HUDM 5122. Recommended: HUDM 6122. Study of latent structure analysis, including measurement models for latent traits and latent classes, path analysis, factor analysis, structural equations, and categorical data analysis.

HUDM 6122 Multivariate analysis I Permission required. Prerequisite: HUDM 5122 or equivalent; HUDM 5123 is recommended. An introduction to multivariate statistical analysis, including matrix algebra, general linear hypothesis and application, profile analysis, principal components analysis, discriminant analysis, and classification methods.

When are HUDM courses offered?

Fall	Spring	Summer

Statistics: 4125 5122/5126 5123 6055 Measurement: 5059	Statistics: 5122 5124 5130* 5133* 6026 6030 6122	5058* 5059 5122 5123*

*Not offered every year.

Approved Statistics Elective Courses at TC and CU

In addition to the above approved HUDM courses, students can choose courses from the following lists. ***Courses other than these require special permission for approval.***

Causal Inference Courses (at TC)

HUDM 5133 Causal Inference for Program Evaluation (Keller)
EDPA 4199 Quantitative Methods Evaluation Policies (Cohodes)
EDPE 6023 Causal Methods for Education Policy Research (Scott-Clayton)

Math Courses (at TC)

MSTM 5030 Topics in probability theory

Statistical Computing/ Data Science Courses

HUDM 5026 Introduction to Data Analysis and Graphics in R
S4199 Statistical Computing in SAS (CU Stats)
P6110 Statistical Computing with SAS (Mailman Biostatistics)
GR4058 Data Mining for Social Science (CU QMSS)
GR5702 Exploratory Data Analysis/ Visual (CU Stats)
GR 5241 Statistical Machine Learning (CU Stat)
GR 5243 Applied Data Science (CU Stat)
GR4063 Data Visualization (CU QMSS)
G4070 GIS Spatial analysis (CU QMSS)
W4111 Introduction to Databases (CU CS)
W4121 Computer Systems for Data Science (CU CS)
P8371 Public Health GIS (CU School Public Health)

GR5702 Exploratory data analysis and Visualization Prerequisites: programming.
This course is covers the following topics: fundamentals of data visualization, layered grammar of graphics, perception of discrete and continuous variables, introduction to Mondran, mosaic

pots, parallel coordinate plots, introduction to ggobi, linked pots, brushing, dynamic graphics, model visualization, clustering and classification.

GR5241 Statistical Machine Learning Prerequisites: STAT GR5206 or the equivalent.
The course will provide an introduction to Machine Learning and its core models and algorithms. The aim of the course is to provide students of statistics with detailed knowledge of how Machine Learning methods work and how statistical models can be brought to bear in computer systems - not only to analyze large data sets, but to let computers perform tasks that traditional methods of computer science are unable to address. Examples range from speech recognition and text analysis through bioinformatics and medical diagnosis. This course provides a first introduction to the statistical methods and mathematical concepts which make such technologies possible.

GR 5243 Applied Data Science This course will incorporate knowledge and skills covered in a statistical curriculum with topics and projects in data science. Programming will covered using existing tools in R. Computing best practices will be taught using test-driven development, version control, and collaboration. Students finish the class with a portfolio on GitHub, and deeper understanding of several core statistical/machine-learning algorithms. Bi-weekly project cycles throughout the semester provide students extensive hands-on experience with various data-driven applications.

COMS W4111 Introduction to Databases (CU CS) Pre-req: COMS W3134, W3136, or W3137 (equivalent courses taken elsewhere are acceptable as well) and Fluency in Java (see note below on programming and nonprogramming options for projects, though). You need to get permission from the instructor if you do not have these prerequisites. This course is intended for both Computer Science majors as well as nonmajors. You will learn what a database system is, how you can design databases effectively and in a principled manner, and how you can develop applications using databases. The course will focus on relational and object-relational databases.

COMS W4121 Computer Systems for Data Science (CU CS) Prerequisites: background in Computer System Organization and good working knowledge of C/C++ Corequisites: CSOR 4246 (Algorithms for Data Science), STATS W4105 (Probability), or equivalent as approved by faculty advisor. An introduction to computer architecture and distributed systems with an emphasis on warehouse scale computing systems. Topics will include fundamental tradeoffs in computer systems, hardware and software techniques for exploiting instruction-level parallelism, data-level parallelism and task level parallelism, scheduling, caching, prefetching, network and memory architecture, latency and throughput optimizations, specialization, and an introduction to programming data center computers.

QMSS GIS Spatial Analysis (QMSS G4070) This course introduces students to basic spatial analytic skills. It covers introductory concepts and tools in Geographic Information Systems (GIS) and database management. As well, the course introduces students to the process of developing and writing an original spatial research project. Topics to be covered include: social theories involving space, place and reflexive relationships; social demography concepts and databases; visualizing social data using geographic information systems; exploratory spatial data analysis of social data and spatially weighted regression models, spatial regression models of social data, and space-time models. Use of open-source software (primarily the R software package) will be taught as well.

QMSS Data Visualization (QMSS G4063) This course is designed to the interdisciplinary and emerging field of data science. It will cover techniques and algorithms for creating effective visualizations based on principles from graphic design, visual art, perceptual psychology, and

cognitive science to enhance the understanding of complex data. Students will be required to complete several scripting, data analysis and visualization design assignments as well as a final project. Topics include: data and image models, social and interactive visualizations, principles and designs, perception and attention, mapping and cartography, network visualization. Computational methods are emphasized and students will be expected to program in R, Javascript, D3, HTML and CSS and will be expected to submit and peer review work through Github. Students will be expected to write up the results of the project in the form of a conference paper submission.

Statistics Courses

GR5221 Time Series Analysis (CU Stat)
GR5222 Nonparametric Statistics (CU Stat)
GR5224 Bayesian Statistics (CU Stat)
GR5231 Survival Analysis (CU Stat)
GR5232 Generalized Linear Models (CU Stat)
GR 5234 Sample Surveys
PUBH P8108 Survival Analysis (CU Mailman)
PUBH P8121 Generalized Linear Models (CU Mailman)
P8120 Analysis of Categorical Data (CU Mailman)
QMSS G4059 Introduction to Missing Data
QMSS Social Network Analysis (QMSS G4062)
QMSS Bayesian Statistics for the Social Sciences (QMSS G4065)

GR5221 Time Series Analysis (CU Stat) Prerequisites: STAT GR5205
Least squares smoothing and prediction, linear systems, Fourier analysis, and spectral estimation. Impulse response and transfer function. Fourier series, the fast Fourier transform, autocorrelation function, and spectral density. Univariate Box-Jenkins modeling and forecasting. Emphasis on applications. Examples from the physical sciences, social sciences, and business. Computing is an integral part of the course.

GR5222 Nonparametric Statistics (CU Stat) Prerequisites: STAT GR5205
Statistical inference without parametric model assumption. Hypothesis testing using ranks, permutations, and order statistics. Nonparametric analogs of analysis of variance. Non-parametric regression, smoothing and model selection.

GR5224 Bayesian Statistics (CU Stat) Prerequisites: STAT GR5205
Bayesian vs frequentist, prior and posterior distributions, conjugate priors, informative and non-informative prior subjective and objective bayes, oneand two sample problems, models for normal data, models for binary data, multivariate normal shrinkage, bayesian linear models, bayesian computation (start early), MCMC algorithms, the Gibbs sampler, hierarchical models, empirical bayes, hypothesis testing, bayes factors, model selection, software: R and WinBUGS

GR5231 Survival Analysis (CU Stat) Prerequisites: STAT GR5205
Survival distributions, types of censored data, estimation for various survival models, nonparametric estimation of survival distributions, the proportional hazard and accelerated lifetime models for regression analysis with failure-time data. Extensive use of the computer.

GR5232 Generalized Linear Models (CU Stat) Prerequisites: STAT GR5205
Statistical methods for rates and proportions, ordered and nominal categorical responses, contingency tables, odds-ratios, exact inference, logistic regression, Poisson regression, generalized linear models.

GR 5234 Sample Surveys Introductory course on the design and analysis of sample surveys. How sample surveys are conducted, why the designs are used, how to analyze survey results, and how to derive from first principles the standard results and their generalizations. Examples from public health, social work, opinion polling, and other topics of interest.

PUBH P8108 Survival Analysis (CU Mailman) This course focuses on methods for the analysis of survival data, or time-to-event data. Survival analysis is a method for analyzing survival data or failure (death) time data, that is time-to-event data, which arises in a number of applied fields, such as medicine, biology, public health, epidemiology, engineering, economics, and demography. A special course of difficulty in the analysis of survival data is the possibility that some individual may not be observed for the full time to failure. Instead of knowing the failure time t, all we know about these individuals is that their time-to- failure exceeds some value y where y is the follow-up time of these individuals in the study. Students in this class will learn how to make inference for the event times with censored. Topics to be covered include survivor functions and hazard rates, parametric inference, life-table analysis, the Kaplan-Meier estimator, k-sample nonparametric test for the equality of survivor distributions, the proportional hazards regression model, analysis of competing risks and bivariate failure-time data.

PUBH P8121 Generalized Linear Models (CU Mailman) The course begins with an examination of generalization of the classical linear regression models. Specific topics followed include models for binary response data such as probit and logit models, analysis of data with discrete ordered responses, models for count data, log-linear models for contingency tables, and analysis of continuous data where the variability increases with the mean. In each topic, description of data analysis methods comes with example of application.

P8120 Analysis of Categorical Data (CU Mailman) A comprehensive overview of methods of analysis for binary and other discrete response data, with applications to epidemiological and clinical studies. It is a second level course that presumes some knowledge of applied statistics and epidemiology. Topics discussed include 2 x 2 tables, m x 2 tables, tests of independence, measures of association, power and sample size determination, stratification and matching in design and analysis, interrater agreement, logistic regression analysis.

QMSS G4059 Introduction to Missing Data The goal of this course is to provide students with a basic knowledge of the potential implications of missing data for their data analyses as well as potential solutions. Students will looks at different types of mechanisms that can generate missing data. This will lay the groundwork for discussions of what types of missing data scenarios can be accommodated by each missing data method discussed subsequently. Finally, students will learn how to deal with missing data in Stata. More advanced techniques will be covered in a course later on, using R and Stan. Any QMSS student is presumed to have sufficient background. Any non-QMSS students interested in taking this course should have sufficient background in regression modeling of discrete variables. Topics to be covered are probability theory, endogenous selection, mechanisms of missing data, single imputation methods, multiple imputation methods, multivariate normal imputation, conditional imputation, and post-imputation diagnostics.

QMSS Social Network Analysis (QMSS G4062) The course is designed to teach students the foundations of network analysis including how to manipulate, analyze and visualize network data themselves using statistical software. We will focus on using the statistical program R for most of the work. Topics will include measures of network size, density, and tie strength, measures of network diversity, sampling issues, making ego-nets from whole networks, distance, dyads, homophily, balance and transitivity, structural holes, brokerage, measures of centrality (degree, betweenness, closeness, eigenvector, beta/Bonacich), statistical inference using network data, community detection, affiliation/bipartite networks, clustering and small worlds; positions, roles and equivalence; visualization, simulation, and network evolution over time.

QMSS Bayesian Statistics for the Social Sciences (QMSS G4065) An introduction to Bayesian statistical methods with applications to the social sciences. Considerable emphasis will be placed on regression modeling and model checking. The primary software used will be Stan, which students do not need to be familiar with in advance. Student in the course will access the Stan library via R, so some experience with R would be helpful but not required. Any QMSS student is presumed to have sufficient background. Any non-QMSS students interested in taking this course should have a comparable background to a QMSS student in basic probability. Topics to be covered are a review of calculus and probability, Bayesian principles, prediction and model checking, linear regression models, Bayesian data collection, Bayesian calculations, Stan, the BUGS language and JAGS, hierarchical linear models, nonlinear regression models, missing data, stochastic processes, and decision theory.

Program Planning Worksheet

Name: _____ Date: _____

Concentration: _____

Career Goals/ Goals for degree:

Course Checklist:

Semester?	Completed?	Course
Fall _____		HUDM 4125
		HUDM 5126 (or 5122)
Spring ____		HUDM 6026
Fall _____		HUDM 5150
		HUDM 6055 or HUDM 6122
		HUDM 5123 or HUDM 6030
		Stat Elective #1: _____
		Stat Elective #2: _____
		Stat Elective #3: _____
		Breadth #1 _____
		Breadth #2 _____