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**WST665/CS770A: Topics in Computer Vision**  
**Web-Scale Image Retrieval**

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**Sung-Eui Yoon**  
(윤성익)

**Course URL:**  
**<http://sglab.kaist.ac.kr/~sungeui/IR>**

**KAIST**



# About the Instructor

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- **Joined KAIST at 2007**
- **B.S., M.S. at Seoul National Univ.**
- **Ph.D. at Univ. of North Carolina-Chapel Hill**
- **Post. doc at Lawrence Livermore Nat'l Lab**
- **Main research focus**
  - **Handling of massive data for various computer graphics and geometric problems**

# My Recent Work

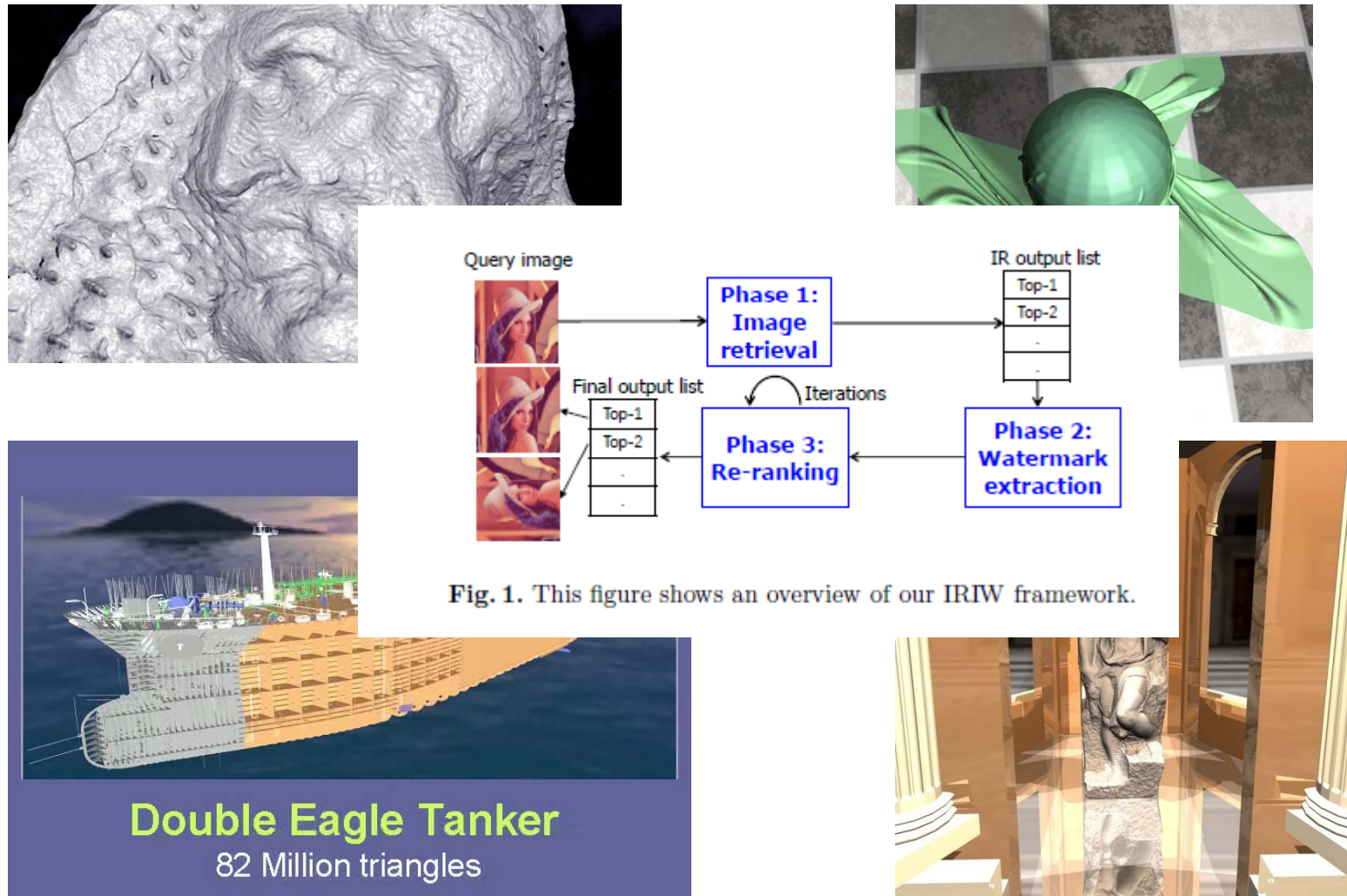


Fig. 1. This figure shows an overview of our IRIW framework.

# About the Instructor

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- Contact info
  - Email: [sungeui@gmail.com](mailto:sungeui@gmail.com)
  - Office: 3432 at CS building
  - Homepage: <http://sglab.kaist.ac.kr/~sungeui>

# Class Information

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- **Class time**
  - 11:00am ~ 12:15pm on MW
- **Office hours**
  - 3:00pm ~ 4:00pm on MW
- **TA**
  - NA

# About the Course

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- **We will focus on the following things:**
  - **Broad understanding on image (and video) retrieval techniques**
  - **In-depth knowledge on recent methods for web-scale data**
  - **Design better technologies as your final project**

# Content-Based Image Retrieval (CBIR)

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- Identify similar images given a user-specified image or other types of inputs



apple



SafeSearch moderate

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Advanced search

- Everything
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Related searches: [apple iphone 5](#) [apple logo](#) [apple wallpaper](#) [red apple](#) [apple background](#) [apple mac](#)



Sort by relevance  
Sort by subject

Any size  
Large  
Medium  
Icon  
Larger than...  
Exactly...

Any color  
Full color  
Black and white







 sungeui.jpg x describe image here 



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미름Cha, Meeyoung (차미영) 조교수; 연구분야Social Computing, Data-Driven Social Science; 학위PhD, KAIST, 2008; 전화번호+82-42-350-2922; 이 메일meeyoungcha ...



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Kristian Segerstrale Playfish, 소셜게임의 미래 현재 소셜게임의 현주소와 빠르게 성장하는 소셜게임의 미래를 예리한 견식으로 소개 ...

# Content-Based Image Retrieval (CBIR)

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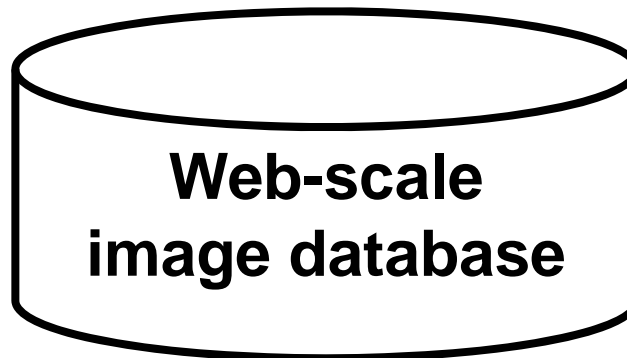
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- Identify similar images given a user-specified image or other types of inputs

Extract image descriptors (e.g., SIFT)



Input



Output

# Applications

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- Search
- Image stitching
- Object/scene/location recognitions
- Robot motion planning
- Copyright detection

# Panorama Stitching



(a) Matier data set (7 images)



iPhone version  
available



(b) Matier final stitch

[Brown, Szeliski, and Winder, 2005]

<http://www.cs.ubc.ca/~mbrown/autostitch/autostitch.html>

# Object Detection

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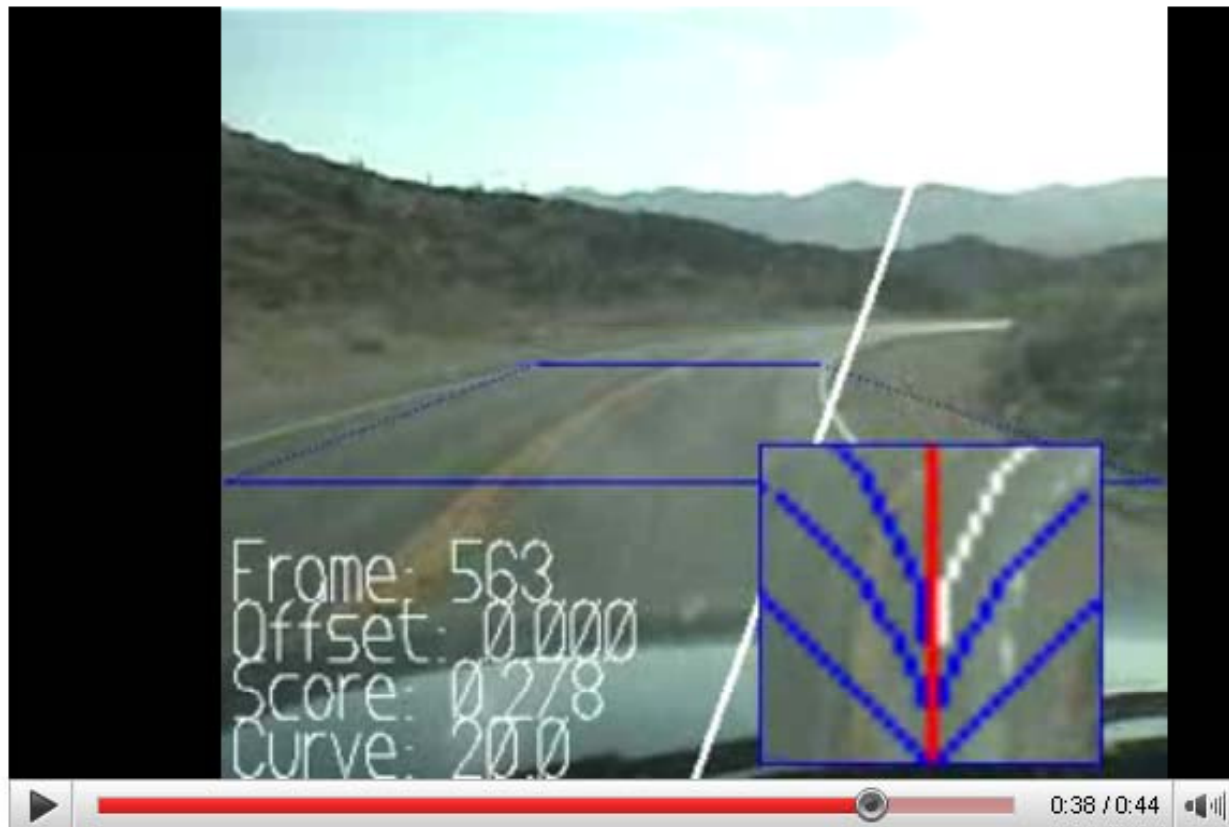
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## PASCAL challenge



# Robot Motion Planning

Autonomous robot vision 1



Autonomous robot

<http://www.youtube.com/watch?v=3SQiow-X3ko>

# Issues for Web-Scale Multimedia Search

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- Too many multimedia data and frequent updates
- Accuracy?
- Performance?
- Novel applications?

Gmail - Inbox - sungeui x Google Calendar x apple - Google Search x

www.google.com/search?q=apple&hl=en&biw=1024&bih=600&prmd=ivnsu&source=lnms&tbn=isch&ei=zxpNTv7bN8\_OrQeB9v

Web **Images** Videos Maps News Shopping Gmail more - Sung-Eui Yoon

Google apple About 177,000,000 results (0.46 seconds) Advanced search SafeSearch moderate

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Sort by **relevance** Sort by subject

Any size Large Medium Icon Larger Exactly

Any color Full color Black

**What if I meant different products of “Apple” computer?**

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 Yoo Mi Choi, 소속: 디자인여성학회 회장 한국디자인 학회 이사 한국애니메이션학회 부회장 인포디자인학회 이사 한국 애니메이션 필름협회 이사 ...

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# Some of Topic Lists

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- Feature detectors
- Descriptors
- Quantization
- Nearest neighbor search
- Bag-of-Word
- Visual vocabulary
- Object categorizations
- Generative and discriminative models
- Hashing techniques
- Text-based retrieval systems
- Large-scale retrieval indexing techniques
- Video related techniques
- Various applications

# Prerequisites

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- **Basic knowledge of linear algebra and data structures**
- **No prior knowledge on computer graphics and computer vision**
- **If you are not sure, please consult the instructor at the end of the course**

# Course Overview

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- half of lectures and other half of student presentations
  - This is a research-oriented course
  - Paper list on various topics is available
- What you will do:
  - Choose papers and present them
  - Propose ideas that can improve the state-of-the-art techniques
  - Quiz and mid-term
  - **and, have fun!**

# Presentations and Final Project

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- **Read papers**
  - Look at pros and cons of each method
  - Think about how we can efficiently handle more realistic and complex scene
- **Propose ideas to address those problems**
  - Show benefits of your ideas and how your ideas can improve the state-of-the-art techniques in a logical manner
  - Implementation of your ideas is not required, but is recommended
- **Team project is allowed**
  - Role of each student should be very clear

# Course Awards

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- **Best speaker and best project**
- **A small gift will be given to the best speaker**
- **A high grade will be given to members of the best project**

# Course Overview

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- **Grade policy**
  - Class presentations: 30%
  - Quiz, assignment, and mid-term: 30%
  - Final project: 40%
  
- **Instructor and students will evaluate presentations and projects**
  - Instructor: 50% weights
  - Students: 50% weights



# Honor Code

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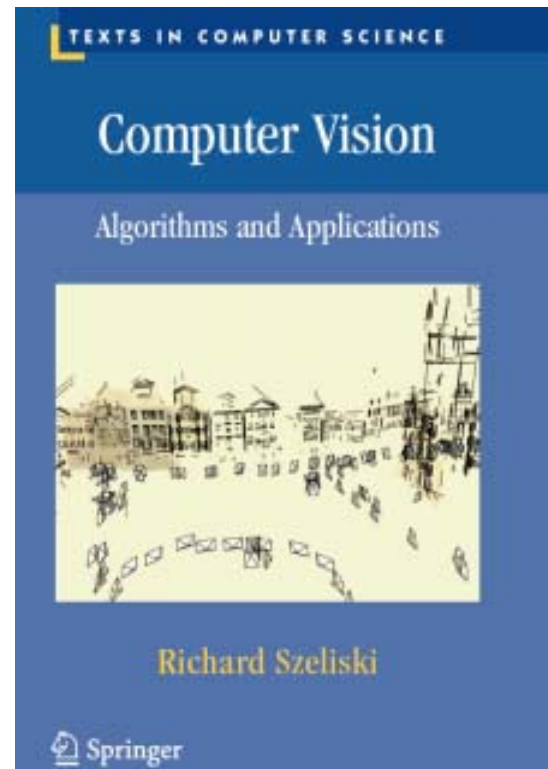
- Collaboration encouraged, but *assignments must be your own work*
- Cite any other's work if you use their code

# Resource

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- No textbook
- Reference
  - Computer vision: algorithms and applications
    - Its file is available (<http://szeliski.org/Book/>)



# Other Resources

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- Our paper reading list
- Technical papers
  - CVPR, ICCV, ECCV, SIGGRAPH, etc.
  - Computer vision resource (<http://www.cvpapers.com/>)
- Course homepages
- Google or Google scholar



# Schedule

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- Please refer the course homepage:
  - <http://sglab.kaist.ac.kr/~sungeui/IR>

# Official Language in Class

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- **English**
  - I'll give lectures in English
  - I may explain again in Korean if materials are unclear to you
  - You are also required to use English, unless special cases

# About You

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- Name
- Your (non hanmail.net) email address
- What is your major?
- Previous experience on image retrieval and computer vision

# Next Time

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- Feature detectors