



**Ninth IAPR International Workshop On  
Document Analysis Systems**

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# DAS 2010

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**June 9 -11, 2010 - Boston, MA**

## **Workshop Program**

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## Welcome to DAS 2010

It is the pleasure of the organizing committee to welcome all participants to the 2010 IAPR workshop on Document Analysis and Recognition (DAS). This year's workshop is being held June 9-11<sup>th</sup> in Boston, Massachusetts, a location situated in the heart of beautiful New England in the northeastern United States. Boston has a rich history that dates back to the 1600's and was a major focal point in the history of the American Revolution and America's fight for independence. Over the years, Boston has developed into a center for industrial, academic and cultural excellence and draws millions of visitors each year.

DAS 2010 is the ninth workshop in a series. The first DAS was held in Kaiserslautern, Germany in 1994, and was followed by Malvern, USA (1996); Nagano, Japan (1998); Rio de Janeiro, Brazil (2000); Princeton, USA (2002); Florence, Italy (2004); Nelson, New Zealand (2006) and Nara Japan (2008). The DAS tradition is to bring together industry, academic and government researchers interested in many aspects of document analysis systems and to provide opportunities for fruitful interaction and collaboration. This year's workshop is organized as a three day, single track event, with oral and poster presentations, as well as working group discussions on the second and third afternoons. Special sessions on contributed datasets and a keynote talk on this same topic provide a compelling theme, and we hope this focus on this topic will help push the field toward greater sharing of data and accepted standards for evaluation.

This year, we received 91 submissions from 25 countries on 6 continents. The papers were reviewed by 45 members of our research community and an international program committee representing 16 different countries. The overall quality was excellent and we have chosen 28 full papers for oral presentation, 37 as poster papers, as well as 15 short papers that will be presented either as posters or in a special short oral session. In addition, six groups are scheduled to present live demos during the poster sessions.

Full papers underwent the standard peer review process and will appear in the official workshop proceedings to be published in the ACM International Conference Proceedings Series, available online as part of the ACM Digital Library. The short papers are included in the unofficial hardcopy proceedings distributed at the event as well as on the DAS 2010 website.

Professor George Nagy, *Professor of Computer Engineering at RPI in Troy, NY* and a founding father in the field of Document Image Analysis, is scheduled to kick-off the workshop with a keynote talk entitled "Document Systems Analysis: Testing, Testing, Testing". In the DAS tradition, we will also be presenting the IAPR Best Student Paper Award, as well as the IAPR Nakano Award for the best paper at this year's event. The latter was established in memory of the late Professor Yasuaki Nakano, the honorary chair of the DAS 2008 workshop and the general chair of DAS 1998.

Socially, the local organizers have arranged an exciting set of events including an opening reception, a duck boat tour of Boston and its harbor and a banquet at the "Top of the Hub" overlooking the city. We would like to thank Rohit Prasad, David Frampton, and Laura Stephens for their tireless work on managing the local arrangements, Srirangaraj Setlur for his work on the workshop web page and publications, and Jeanne Steinberg for her help in assembling the hardcopy proceedings. Their behind the scenes efforts are a key to the success of DAS2010. We also wish to take this opportunity to thank Raytheon BBN Technologies and Hitachi for their generous financial support.

We hope that this workshop reflects the excellence that has made DAS an important biennial event in our community. Please enjoy your time in Boston and your participation in DAS2010!

*David Doermann*, University of Maryland, College Park  
*Venu Govindaraju*, University at Buffalo, SUNY  
*Daniel Lopresti*, Lehigh University  
*Prem Natarajan*, Raytheon BBN Technologies

*DAS General Chairs*

## Workshop-at-a-Glance

| DAS 2010 Workshop Schedule |  |   |  |
|----------------------------|--|---|--|
| Time                       | Wednesday: June 9, 2010  | Thursday: June 10, 2010   | Friday: June 11, 2010  |
| 0800                       | Breakfast (PreFunction)  | Breakfast (PreAssembly)   | Breakfast (PreAssembly)  |
| ...                        | <b>Registration (Pre-Assembly)</b>   |   |  |
| 0900                       | Welcome followed by<br>Keynote address:<br><b>Prof. George Nagy</b><br>Chair: David Doermann<br>(Belvidere Ballroom) | <b>Oral Session 4</b><br>Chair: George Thoma<br>(Belvidere Ballroom)          | <b>Oral Session 5</b><br>Chair: Horst Bunke<br>(Belvidere Ballroom)        |
| 0920                       |  |   |  |
| 0940                       |  |   |  |
| 1000                       |  |   |  |
| 1020                       | Morning Break<br>(PreFunction)   | Morning Break<br>(PreAssembly)  | Morning Break<br>(PreAssembly)   |
| 1040                       | <b>Oral Session 1</b><br>Chair: Koichi Kise<br>(Belvidere Ballroom)  | <b>Short paper Oral Session</b><br>Chair: Henry Baird<br>(Belvidere Ballroom) | <b>Oral Session 6</b><br>Chair: Elisa Barney Smith<br>(Belvidere Ballroom) |
| 1100                       |  |   |  |
| 1120                       |  | Working Group set-up  |  |
| 1140                       |  |   |  |
| 1200                       | Lunch (On your own)*   | Lunch (On your own)*  | Lunch (On your own)*   |
| 1320                       | <b>Oral Session 2</b><br>Chair: Masaki Nakagawa<br>(Belvidere Ballroom)  | <b>Working Group Discussions</b><br>(Boardroom/Copley/<br>Mariner)            | <b>Oral Session 7</b><br>Chair: Thomas Breuel<br>(Belvidere Ballroom)      |
| 1340                       |  |   |  |
| 1400                       |  | Afternoon Break<br>(PreAssembly)  |  |
| 1420                       |  |   |  |
| 1440                       | Afternoon Break<br>(PreAssembly)   | <b>Poster / Demo Session 2</b><br>(Westminster<br>& PreAssembly)              | Afternoon Break<br>(PreAssembly)   |
| 1500                       | <b>Oral Session 3</b><br>Chair: Andreas Dengel<br>(Belvidere Ballroom)   |   | <b>Working Group Discussions</b><br>(Boardroom/Copley/<br>Mariner)         |
| 1520                       |  |   |  |
| 1540                       |  |   |  |
| 1600                       |  |   |  |
| 1620                       | <b>Reception (Westminster<br/>&amp; PreAssembly)</b>   | <b>Excursion<br/>(Boston Duck Tour)</b>                                       | <b>Working Group Plenary<br/>Reports</b><br>(Belvidere Ballroom)           |
| 1640                       | <b>Poster / Demo Session 1</b><br>(Westminster<br>& PreAssembly)   |   | Workshop Conclusion  |
| 1700                       |  |   |  |
| 1720                       |  |   |  |
| 1740                       |  |   |  |
| 1800                       | Break  |   |  |
| 1830                       | <b>Banquet<br/>(Top of The Hub)</b>  |   |  |
| ...                        |  |   |  |

\*Options for lunch can be found in your registration packet.

# Workshop Detailed Schedule

Wednesday - June 9, 2010

0900 - 1020 Welcome and Keynote Talk (Belvidere Ballroom)

Keynote Talk: *Document Systems Analysis: Testing, Testing, Testing:*  
Prof. George Nagy, RPI.

1020 - 1040 Coffee Break (PreFunction)

1040 - 1200 Oral Session 1 - Ground-truth and Datasets 1 (Belvidere Ballroom)

1040 Ground Truth Creation for Handwriting Recognition in Historical Documents - *Andreas Fischer, Emanuel Indermühle, Horst Bunke, Gabriel Viehhauser, and Michael Stolz*

1100 IBN SINA: A database for research on processing and understanding of Arabic manuscripts images - *Reza Farrahi Moghaddam, Mohamed Cheriet, Mathias Adankon, Kostyantyn Filonenko, and Robert Wisnovsky*

1120 A Framework for the Assessment of Text Extraction Algorithms on Complex Colour Images - *Antonio Clavelli, Dimosthenis Karatzas, and Josep Lladós*

1140 An analysis of binarization ground truthing - *Elisa H. Barney Smith*

1200 - 1320 Lunch (On your own)

1320 - 1440 Oral Session 2 - Handwriting Recognition (Belvidere Ballroom)

1320 Toward Affine Recognition of Handwritten Mathematical Characters - *Oleg Golubitsky, Vadim Mazalov, and Stephen Watt*

1340 Data-Embedding Pen — Augmenting Ink Strokes with Meta-Information - *Marcus Liwicki, Seiichi Uchida, Masakazu Iwamura, Shinichiro Omachi, and Koichi Kise*

1400 Gabor Features for Offline Arabic Handwriting Recognition - *Jin Chen, Huaigu Cao, Rohit Prasad, Anurag Bhardwaj, and Premkumar Natarajan*

1420 Improved Classification through Runoff Elections - *Oleg Golubitsky, and Stephen Watt*

1440 - 1500 Coffee Break (PreAssembly)

1500 - 1620 Oral Session 3 - Layout Analysis 1 (Belvidere Ballroom)

1500 Table Detection in Heterogeneous Documents - *Faisal Shafait, and Ray Smith*

1520 Context-Aware and Content-Based Dynamic Voronoi Page Segmentation - *Mudit Agrawal, and David Doermann*

1540 Analysis and Taxonomy of Column Header Categories for Web Tables - *Sharad Seth, Ramana C. Jandhyala, Mukkai Krishnamoorthy, and George Nagy*

1600 Memory-Based Recognition of Camera-Captured Characters - *Masakazu Iwamura, Tomohiko Tsuji, and Koichi Kise*

1620 - 1700 Reception (Westminster & PreAssembly)

1700 - 1830 Poster/Demo Session 1 (Westminster & PreAssembly)

P1-1: Typeface Personality Traits and Their Design Characteristics - *Ying Li, and Ching Y. Suen*

P1-2: Virtual Restoration of Old Photos for Non-Expert Users - *Giuseppe Mazzola, Edoardo Ardizzone, and Haris Dindo*

P1-3: A Bag of Notes Approach to Writer Identification in Old Handwritten Music Scores - *Albert Gordo, Alicia Fornés, Ernest Valveny, and Josep Lladós*

P1-4: Use of MKL as Symbol Classifier for Gujarati Character Recognition - *Ehtesham Hassan, Santanu Chaudhury, M Gopal, and Jignesh Dholakia*

P1-5: Document Inspection Using Text-Line Alignment - *Joost van Beusekom, Faisal Shafait, and Thomas M. Breuel*

P1-6: A Skeleton-Based Method for Multi-Oriented Video Text Detection - *Trung Quy Phan, Shivakumara, Palaiahnakote and Chew Lim Tan*

P1-7: A New Wavelet-Median-Moment based Method for Multi-Oriented Video Text Detection - *Shivakumara Palaiahnakote, Anjan Dutt, Chew Lim Tan, and Umapada Pal*

P1-8: An Impact of Linguistic Features on Automated Classification of OCR Texts - *Gudila P. Moshi, Lazaro S.P. Busagala, Wataru Ohyama, Tetsushi Wakabayashi, and Fumitaka Kimura*

- P1-9: Form Recognition from ink strokes on tablet - *De Cao Tran, Patrick Franco, and Jean-Marc Ogier*
- P1-10: Methodological Considerations on the INEX Structure Extraction Competition - *Hervé Déjean, and Jean-Luc Meunier*
- P1-11: Expansion of Queries and Databases for Improving the Retrieval Accuracy of Document Portions - *Koichi Kise, Megumi Chikano, Kazumasa Iwata, Masakazu Iwamura, Seiichi Uchida, and Shinichiro Omachi*
- P1-12: Higher Order MRF for Foreground-Background Separation in Multispectral Images of Historical Manuscripts - *Martin Lettner, and Robert Sablatnig*
- P1-13: Introducing a New Image Dissimilarity Measure with an Application to Character Image Clustering in Degraded Historical Documents - *Sebastian Colutto*
- P1-14: smartFIX Statistics – Towards Systematic Document Analysis Performance Evaluation and Optimization - *Benjamin Seidler, Markus Ebbecke, and Michael Gillmann*
- P1-15: A Polar-based Logo Representation based on Topological and Colour Features - *Farshad Nourbakhsh, Dimosthenis Karatzas, and Ernest Valveny*
- P1-16: A Histogram-based Technique for Automatic Threshold Assessment in a Run Length Smoothing-based Algorithm - *Stefano Ferilli, Teresa M.A. Basile, and Floriana Esposito*
- P1-17: Latent Dirichlet Allocation Based Writer Identification in Offline Handwriting - *Anurag Bhardwaj, Manavender Malgireddy, Srirangaraj Setlur, Venu Govindaraju, and Sitaram Ramachandrala*
- P1-18: Towards More Effective Distance Functions for Word Image Matching - *Raman Jain, C. V. Jawahar*
- P1-19: Writer clustering using Multi Scale Integral Orientation Features - *Asim Imdad Wagan, Stephane Bres and Hubert Emptoz*
- P1-20: Connected Component level Multiscript Identification from Ancient Document Images - *Sheikh Faisal Rashid, Faisal Shafait and Thomas Breuel*
- P1-21: Bibliographic information Extraction of Document Title Pages by Combining FDA's N-best Results and Layout DP-Matching - *Masakazu Fujio, Takeshi Nagasaki and Toshikazu Takahashi*
- P1-22: A Visual Perception Approach to Segment Images of Historical Documents - *Carlos Mello*
- P1-23: Improvements in Optical Structure Recognition Application - *Igor Filippov, Marc Nicklaus and John Kinney (Demo)*
- P1-24: HIT-OR3C: An Opening Recognition Corpus for Chinese Characters - *Shusen Zhou, Qingcai Chen, and Xiaolong Wang (Demo)*
- P1-25: The Data Embedding Pen: Embedding Knowledge in Paper - *Marcus Liwicki & Seiichi Uchida(Demo)*

**Thursday - June 10, 2010**

**0900 - 1020 Oral Session 4 - Ground-truth and Datasets 2 (Belvidere Ballroom)**

- 0900** IAM-OnDo-database: an Online Handwritten Document Database with Non-uniform Contents - *Emanuel Indermühle, Marcus Liwicki, and Horst Bunke*
- 0920** Document Analysis Issues in Reading Optical Scan Ballots - *Daniel Lopresti, George Nagy, and Elisa Barney Smith*
- 0940** An open approach towards the benchmarking of table structure recognition systems - *Asif Shahab, Faisal Shafait, Thomas Kieninger, and Andreas Dengel*
- 1000** Investigator Name Recognition from Medical Journal Articles: A Comparative Study of SVM and Structural SVM - *Xiaoli Zhang, Jie Zou, Daniel X. Le, and George Thoma*

**1020 - 1040 Coffee Break (PreAssembly)**

**1040 - 1140 Short Paper Oral Session (Belvidere Ballroom)**

- 1040** Table Metadata: Headers, Augmentations and Aggregates - *George Nagy, Mukkai Krishnamoorthy, Raghav Padmanabhan, Ramana C. Jandhyala and William Silversmith*
- 1055** Robust Recognition Method of Chemical Structure Images for Japanese Published Patent Applications - *Akio Fujiyoshi, Koji Nakagawa and Masakazu Suzuki*
- 1110** DynaQ - Faceted Search for Document Retrieval - *Christian Reuschling, Stefan Agne and Andreas Dengel*
- 1125** GEDI – A Groundtruthing Environment for Document Images - *David Doermann and Elena Zotkina*

**1140 - 1200 Working Group Set up (Belvidere Ballroom)**

**1200 - 1320 Lunch (On your own)**

|  |                                  |
|--|----------------------------------|
| <b>1320 - 1420</b>   | <b>Working Group Discussions</b> |
| <b>1420 - 1540</b>   | <b>Coffee Break</b>              |
| <b>1540 - 1600</b>   | <b>Poster/Demo Session 2</b>     |
| P2-1: Improving XED for extracting content from Arabic PDFs - <i>Karim Hadjar, Rolf Ingold</i>   |                                  |
| P2-2: A Kernel-based Approach to Document Retrieval - <i>Albert Gordo, Jaume Gibert, Ernest Valveny, Marçal Rusiñol</i>  |                                  |
| P2-3: Associating Figures with Descriptions for Patent Documents - <i>Linlin Li, Chew Lim Tan</i>  |                                  |
| P2-4: Document Analysis Applied to Fragments: Feature Set for the Reconstruction of Torn Documents - <i>Markus Diem, Florian Kleber, Robert Sablatnig</i>                                      |                                  |
| P2-5: Page Frame Detection for Double Page Document Images - <i>Nikolaos Stamatopoulos, Basilis Gatos, Thodoris Georgiou</i>   |                                  |
| P2-6: Automatic Unsupervised Parameter Selection for Character Segmentation - <i>Giorgos Vamvakas, Nikolaos Stamatopoulos, Basilis Gatos, Stavros Perantonis</i>                               |                                  |
| P2-7: Word Spotting in Alice's Adventures Underground using Multi Scale Integral Orientation Features - <i>Asim Wagan, Stephane Bres, Hubert Emptoz</i>  |                                  |
| P2-8: A New approach for centerline extraction in handwritten strokes An Application to the constitution of a code book - <i>Hani Daher, Veronique Eglin, Stephane Bres, Nicole Vincent</i>    |                                  |
| P2-9: Safely Selecting Subsets of Training Data - <i>Dawei Yin, Chang An, Henry Baird</i>  |                                  |
| P2-10: Improving Handwriting Recognition by the Use of Semantic Information - <i>Marcus Liwicki, Hassan Mohamed Abou Eisha, Andreas Dengel</i>   |                                  |
| P2-11: The BBN Document Analysis Service: A Platform for Multilingual Document Translation - <i>Ehry MacRostie, Rohit Prasad, Stephen Rawls, Matin Kamali, Huaigu Cao, Premkumar Natarajan</i> |                                  |
| P2-12: Ground-Truthed Dataset of Chemical Structure Images in Japanese Published Patent Applications - <i>Koji Nakagawa, Akio Fujiyoshi, Masakazu Suzuki</i>                                   |                                  |
| P2-13: Techniques for Static Handwriting Trajectory Recovery: A Survey - <i>Vu Nguyen, Michael Blumenstein</i>   |                                  |
| P2-14: Detecting and Recognizing Tables in Spreadsheets - <i>Iyad Abu Doush, Enrico Pontelli</i>   |                                  |
| P2-15: Touch & Write — A Multi-Touch Table with Pen-Input - <i>Marcus Liwicki, Saher Mohamed El-Neklawy, Andreas Dengel</i>  |                                  |
| P2-16: Faithful Mathematical Formula Recognition from PDF Documents - <i>Josef Baker, Alan Sexton, Volker Sorge</i>  |                                  |
| P2-17: A Post-Processing Scheme for Malayalam using Statistical Sub-character Language Models - <i>Karthika Mohan, C.V. Jawahar</i>  |                                  |
| P2-18: An Eigen Value Based Approach for Text Detection in Video - <i>Guru D. S, Manjunath S, Shivakumara Palaiahnakote, Chew-Lim Tan</i>  |                                  |
| P2-19: A Branch and Bound Algorithm for Graphical Symbol Recognition in Document Images - <i>Nibal Nayed and Thomas M. Breuel</i>  |                                  |
| P2-20: Metadata for Structured Document Datasets - <i>Henry F. Korth, Dezhao Song and Jeff Heflin</i>  |                                  |
| P2-21: Elastic matching in linear time and constant space - <i>Scott MacLean and George Labahn</i>   |                                  |
| P2-22: Performance Evaluation of Curled Textlines Segmentation Algorithms - <i>Syed Saqib Bukhari, Faisal Shafait and Thomas M. Breuel</i>   |                                  |
| P2-23: Using Audio Based Disambiguation for Improving Handwritten Mathematical Content Recognition in Classroom Videos - <i>Smita Vemulapalli and Monson H. Hayes III</i>                      |                                  |
| P2-24: A Camera-Based Information Acquisition Interface - <i>Masakazu Iwamura, Koichi Kise(Demo)</i>   |                                  |
| P2-25: The DAE (Document Analysis and Exploitation) Project - <i>Bart Lamiroy (Demo)</i>   |                                  |
| P2-26: GEDI – A Groundtruthing Environment for Document Images - <i>David Doermann and Elena Zotkina (Demo)</i>  |                                  |
| P2-27: DynaQ - Faceted Search for Document Retrieval - <i>Christian Reuschling, Stefan Agne and Andreas Dengel (Demo)</i>  |                                  |

**1600 - 1800**

**Excursion - Boston Duck Tour**

**1800 - 1830**

**Break**

**1830 -**

**Banquet - Top of the Hub Restaurant**

\*Instructions regarding logistics for the Excursion and Banquet can be found in your registration packet.

Friday - June 11, 2010

0900 - 1020

**Oral Session 5 - Text Processing (Belvidere Ballroom)**

0900

Overlapped Text Segmentation Using Markov Random Field and Aggregation - *Xujun Peng, Srirangaraj Setlur, Venu Govindaraju, and Ramachandhula Sitaram*

0920

Handwritten Arabic Text Line Segmentation using Affinity Propagation - *Jayant Kumar, Wael Abd-Almageed, Le Kang, and David Doermann*

0940

Text Extraction From Graphical Document Images Using Sparse Representation - *Thai V. Hoang, and Salvatore Tabbone*

1000

Occluded text restoration and recognition - *Lanlan Chang, Jun Sun, Misako Suwa, Hiroaki Takebe, Yuan He, and Satoshi Naoi*

1020 - 1040

**Coffee Break (PreAssembly)**

1040 - 1200

**Oral Session 6 - Layout Analysis 2 (Belvidere Ballroom)**

1040

Binarization of Historical Document Images Using the Local Maximum and Minimum - *Su Bolan, Lu Shijian, and Chew Lim Tan*

1100

A System to Detect Rooms in Architectural Floor Plan Images - *Sébastien Macé, Hervé Loc-teau, Ernest Valveny, and Salvatore Tabbone*

1120

Information extraction by finding repeated structure - *Evgeniy Bart, and Prateek Sarkar*

1140

Document Image Segmentation using Discriminative Learning over Connected Components - *Syed Saqib Bukhari, Mayce Ibrahim Ali, Faisal Shafait, and Thomas Breuel*

1200 - 1320

**Lunch (On your own)**

1320 - 1440

**Oral Session 7 - Recognition and Retrieval (Belvidere Ballroom)**

1320

Query Driven Word Retrieval in Graphical Documents - *Partha Roy, Umapada Pal, and Josep Lladós*

1340

Analysis of Whole-Book Recognition - *Pingping Xiu, and Henry Baird*

1400

Nearest Neighbor based Collection OCR - *Pramod Kompalli, Jawahar C. V., & Manmatha R.*

1420

Efficient Logo Retrieval Through Hashing Shape Context Descriptors - *Marçal Rusiñol, and Josep Lladós*

1440 - 1500

**Coffee Break (PreAssembly)**

1500 - 1600

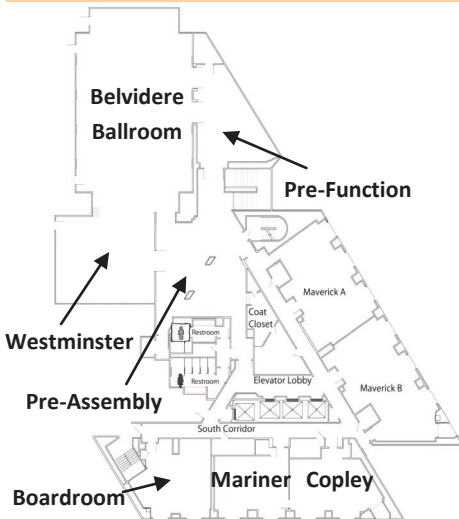
**Working Group Discussions (Boardroom/Copley/Mariner)**

1600 - 1640

**Working Group Plenary Reports (Belvidere Ballroom)**

1640

**Workshop Ends - Closing Remarks**



**Hilton Back Bay Floor Plan—2nd Floor**

**Excursion—Boston Duck Tours**

([www.bostonducktours.com](http://www.bostonducktours.com)): The fun begins as soon as you board your "DUCK", a W.W.II style amphibious landing vehicle. You'll cruise by all the places that make Boston the birthplace of freedom and a city of firsts. Your ConDUCKtor will be giving you lots of little known facts and interesting insights about the unique and wonderful city that is Boston. A "Splashdown" finale into the Charles River will give you a breathtaking view of the Boston and Cambridge skylines.

**Banquet location - Top of the Hub**

([www.topofthehub.net](http://www.topofthehub.net)): One of Boston's finest dining destinations, the award-winning Top of the Hub features outstanding cuisine, impeccable service, and a sophisticated ambience. Soaring 52 floors above the Back Bay, the restaurant and adjoining Skywalk Observatory offer guests a spectacular view of the Boston skyline from every table.

# DAS 2010 Organizing Committee

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