Actionable Intelligence:
Big Data for Student Success

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Strategic Goals

1. Strategic business intelligence for student success
2. Improve academic success with analytics
3. Proactive intervention strategies
4. Automatic alerts and notifications
5. Improve faculty and support staff communications
6. Leverage innovations in technology to automate key business strategies
Technology

- Database 11g
- Application Express (APEX)
- Advanced Analytics and R Programming
- Business Intelligence Enterprise Edition (OBIEE)
- Data Integrator
- Endeca Information Discovery
- PHP/MySql
Improve Reporting

- Improve information access for faculty and advisors
- Provide key reports and analysis
- Interactive class roster with photos and at-risk metrics
- Drag-n-Drop reporting
- Historical trends and patterns
Valdosta State Current Business Intelligence Architecture

Custom Data Warehouse

Business Intelligence Solutions
• OBIEE
• Endeca
• SPSS
• ETL
• ODI
• ERP/CRM
• Ellucian
• Oracle PeopleSoft
Valdosta State University: ROI First Year

At-risk Characteristics

- High School
- HS GPA
- SAT Total

First year at VSU

- Progression Rates: 5% increase
- Retention Rates: 2% increase
- Pass Rates: 3% increase
Oracle (OBIEE) Business Intelligence
Gender Trends by College Department

Time run: 9/24/2014 11:01:09 AM

Student Count

[Graph showing trends of student count by gender from Fall 2002 to Fall 2014]
<table>
<thead>
<tr>
<th>Course College Dimension</th>
<th>Course Department Dimension</th>
<th>Course Level Dimension</th>
<th>Credit Hours Generated</th>
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<tbody>
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<td>▼ Course Department Total</td>
<td>▼ Course Level Total</td>
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<td>▼ Course Level Total</td>
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<td>63,584</td>
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<td>70,064</td>
<td></td>
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<tr>
<td></td>
<td>▼ Lower Undergrad</td>
<td></td>
<td>798,502</td>
<td>50,902</td>
<td>50,902</td>
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<td></td>
<td>▼ Upper Undergrad</td>
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<tr>
<td></td>
<td>▼ Grad I</td>
<td></td>
<td>23,734</td>
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<td>1,538</td>
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<td></td>
<td>▼ Grad II</td>
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<td>27,883</td>
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<td></td>
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</tbody>
</table>
Oracle (OBIEE) Business Intelligence
Oracle (OBIEE) Business Intelligence
Gender Trends by College Department

Title

Gender Trends by College Department


Graph (2)

Student Count

Term

Student Count

Female
Male

Term

Student Count

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Oracle (OBIEE) Business Intelligence
SWIS (Social Work Information System). Custom developed application to provide custom reports, track forms, placements, agencies, program tracks, and documents.
### Course Summary

#### By User Role

<table>
<thead>
<tr>
<th>Term Desc</th>
<th>Crn</th>
<th>Subject</th>
<th>Course Num</th>
<th>Course Section</th>
<th>Course Title</th>
<th>Students Enrolled</th>
<th>Seats Available</th>
<th>Instructors Email</th>
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<tbody>
<tr>
<td>Fall 2012</td>
<td>00000</td>
<td>ACCT</td>
<td>2101</td>
<td>A</td>
<td>Principles of Accounting I</td>
<td>84</td>
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<tr>
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<td>00000</td>
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<td>C</td>
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<td>ACCT</td>
<td>2101</td>
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<td><a href="mailto:bahaugab@valdosta.edu">bahaugab@valdosta.edu</a></td>
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<td>00060</td>
<td>ACCT</td>
<td>2101</td>
<td>G</td>
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<tr>
<td>Fall 2012</td>
<td>00060</td>
<td>ACCT</td>
<td>2102</td>
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<td>Fall 2012</td>
<td>00060</td>
<td>ACCT</td>
<td>2102</td>
<td>F</td>
<td>Principles of Accounting II</td>
<td>36</td>
<td>2</td>
<td><a href="mailto:bahaugab@valdosta.edu">bahaugab@valdosta.edu</a></td>
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<tr>
<td>Fall 2012</td>
<td>00000</td>
<td>ACCT</td>
<td>3100</td>
<td>A</td>
<td>Intro to Fraud Examination</td>
<td>32</td>
<td>6</td>
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# Class Roster that Highlights At-Risk Students

## Course ACCT 2101 A - Principles of Accounting I

<table>
<thead>
<tr>
<th>Student Photo</th>
<th>Last Name</th>
<th>First Name</th>
<th>Middle Name</th>
<th>Attendance/Course Progress Flags</th>
<th>Email</th>
<th>At Risk General</th>
<th>At Risk Math</th>
<th>At Risk Reading</th>
<th>DegreeWorks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doe</td>
<td>J</td>
<td>Tanner</td>
<td></td>
<td>Attendance/Course Progress Flags</td>
<td><a href="mailto:bahsugab@valdosta.edu">bahsugab@valdosta.edu</a></td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>DegreeWorks</td>
</tr>
<tr>
<td>Doe</td>
<td>J</td>
<td>Jahkeem</td>
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<td>DegreeWorks</td>
</tr>
<tr>
<td>Doe</td>
<td>J</td>
<td>Qamar</td>
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<td>Attendance/Course Progress Flags</td>
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<td>No</td>
<td>No</td>
<td>No</td>
<td>DegreeWorks</td>
</tr>
</tbody>
</table>
Automatic Alerts, Triggers, and Events

- Sends notification to the student’s advisor and academic success center
- If the student lives on campus, a wellness check is automatically triggered through the housing office
- If the student is in an FLC, all other instructors are notified
# Student Progress in all Courses

## Student

<table>
<thead>
<tr>
<th>STUDENT_PHOTO</th>
<th>STUDENT_NAME</th>
<th>EMAIL_VSU</th>
<th>FULL_CUMULATIVE_GPA</th>
<th>ADVISOR_NAME</th>
<th>ADVISOR_EMAIL</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>John Doe</td>
<td><a href="mailto:bahngub@valdosta.edu">bahngub@valdosta.edu</a></td>
<td>-</td>
<td>Robert Smith</td>
<td><a href="mailto:bahngub@valdosta.edu">bahngub@valdosta.edu</a></td>
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</table>

## Student Schedule

<table>
<thead>
<tr>
<th>CRN</th>
<th>Course</th>
<th>Instructor Email</th>
<th>Attendance Status</th>
<th>Attendance Comments</th>
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</thead>
<tbody>
<tr>
<td>80354</td>
<td>ENGL 1101 T - Composition I</td>
<td><a href="mailto:idoe@valdosta.edu">idoe@valdosta.edu</a></td>
<td>Level 2: Multiple Absences, At-Risk</td>
<td>Malee has accrued three absences. We are in the process of setting up a meeting to discuss the matter.</td>
</tr>
<tr>
<td>80042</td>
<td>KSPE 1020 C - Weight Training</td>
<td><a href="mailto:idoe@valdosta.edu">idoe@valdosta.edu</a></td>
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<tr>
<td>80643</td>
<td>VSU 1101 K - Keys to College Success</td>
<td><a href="mailto:idoe@valdosta.edu">idoe@valdosta.edu</a></td>
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<tr>
<td>91056</td>
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<td><a href="mailto:idoe@valdosta.edu">idoe@valdosta.edu</a></td>
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<td>HIST 2112 K - United States History Sn 1985</td>
<td><a href="mailto:idoe@valdosta.edu">idoe@valdosta.edu</a></td>
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Custom Application Integrations

### Valdosta State University

#### Degreeworks Production Environment

<table>
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<tr>
<th>Date</th>
<th>Event</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>11:49 AM</td>
<td>Student View</td>
<td>A87111 as of 08/20/2012 at 11:49</td>
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#### Requirements

- **Current Holds Affecting Registration or Graduation**
  - You have no holds.

- **Master of Public Administration**
  - Classified as a Regular Graduate Student
  - You meet the minimum GPA requirement
  - Degree Requirements

- **Major in Public Administration - MPA**
  - Foundations Seminar in PA
  - Quantitative Methods for PA
  - Policy Analysis

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>PADM 7300</td>
<td>Foundation in MPA</td>
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<tr>
<td>PADM 7060</td>
<td>Quantitative Methods for PA</td>
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<td>PADM 7090</td>
<td>Policy Analysis</td>
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DegreeWorks Login Statistics

By Year

Logins by Year

- 2010: 13,520
- 2011: 31,370
- 2012: 47,760
- 2013: 62,650
- 2014: 37,260
Course Withdrawal Alerts

- What happens if a student drops a course that is in his/her cohort?
- What actions should take place?

From: flc_coordinator@valdosta.edu
Sent: Monday, September 17, 2012 8:13 AM
To: Brian A. Haugabrook
Subject: FLC NOTIFICATION Course Withdrawal (Gi)

Dear Brian Haugabrook,

J Doe (@valdosta.edu) has withdrawn from PERS 2160 C FLC course and currently lives on campus. You are encouraged to follow up with the student.

Login to the FLC Portal for more information. https://apex.valdosta.edu/apexf?p=FLC
<table>
<thead>
<tr>
<th>TERM</th>
<th>DEPARTMENT</th>
<th>SUBJ</th>
<th>CRSE_NUMB</th>
<th>INCOME</th>
<th>COST</th>
<th>REVENUE</th>
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<tbody>
<tr>
<td>Summer 2013</td>
<td>Dept of Phy/Ast/Geosciences</td>
<td>ASTR</td>
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</table>

**Course Planning and Cost Projection**
MyVSU Student Portal

- Data-driven portal based on student attributes
- Tailored advertisements promoting support services
- Advisor alerts to improve communication
- Single sign-on to email, D2L, Banner, library, and other services
- Integration with VSU data warehouse to deliver real-time prioritization to advertisements and messages
Advanced and Predictive Analytics

- Identify key attributes to improve student success
- Create decision trees for individual success probability
- Provide real-time analytics
- Data mining and full access to models
- Provide students with predicted course and program difficulty
- Compare predictions with historic patterns to ensure accuracy
### Student Attributes Ranked by Predictive Importance

#### Displays attributes included in AI model that contribute to student success

Time run: 8/13/2014 12:21:02 PM

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Predictive Importance</th>
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<tbody>
<tr>
<td>Full Cumulative GPA</td>
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<tr>
<td>Institutional Term GPA</td>
<td>10.87</td>
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<tr>
<td>Hours Earned</td>
<td>8.80</td>
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<tr>
<td>Academic Standing</td>
<td>6.76</td>
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<td>heroic Received</td>
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<tr>
<td>High School GPA</td>
<td>2.09</td>
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<td>Race</td>
<td>1.62</td>
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<td>Ethnicity</td>
<td>0.76</td>
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<td>Other Federal Loans</td>
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<td>Academic Degree</td>
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<td>Gender</td>
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<td>First Generation</td>
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<tr>
<td>Enrolled Term</td>
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<td>Main Campus Courses</td>
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<td>Pell Received</td>
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<td>SAT ACT Math</td>
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<td>Partial Online Courses</td>
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<td>Attempted Hours</td>
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<tr>
<td>Fully Online Courses</td>
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</table>
The Decision Tree algorithm is used in this application for classifying students and is based on axis parallel splits of the data. The splits associated with a given leaf node in the tree result in a rule that defines the node or student segment. Such rules can easily be understood and easily used within a database to identify a set of records.

A decision tree predicts a target value by asking a sequence of questions. The goal is to ask questions that, taken together, uniquely identify specific subset of students that best reflects the target values. Graphically, this process forms a tree structure.

Enter one or more Student Id(s) to get contact details:

Student Id:
VSU000005

ACT English, Math and Reading Scores for students filtered by Counselor

SAT Math and Verbal Scores for At Risk Students
Displays all at-risk students SAT Math and Verbal scores
Get At-Risk Students Now
Please select attributes you would like to include in the advanced analytic model. This model will be dynamically run in the database using the latest table data. Please feel free to re-run this model multiple times with different attributes depending on your needs.

Dynamic Execution of the Decision Tree Function
Please select the attributes to include in the execution of the Decision Tree Function
Time run: 9/5/2014 10:37:00 AM

Values that are being evaluated in the database:
021109 -- 021109

Decision Tree Model that Determines At-Risk in Math
Displays rules that were generated from decision tree model to determine if a student is at risk
Time run: 9/5/2014 20:36:21 AM

At-Risk Students by Course Name
Displays At-Risk Students by Course Name
Time run: 9/5/2014 10:31:44 AM

Number of At-Risk Students by Class

- Algebra and Geometry for Teachers
- Analytic Geometry & Calculus I
- Analytic Geometry & Calculus II
- Calculus I
- College Algebra
Dynamically Running R Function
Creating an opaque view
### Alerts
- Please come in for a consult
- Erica - You have at-risk students, please inter...

### Student By Grade
Displays a full list of students per professor by grade

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Instructor Name</th>
<th>Final Grade</th>
<th>Revised id</th>
<th>Student First Name</th>
<th>Student Last Name</th>
<th>Student Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra and Geom for Teachers</td>
<td>Erica Daniel</td>
<td>S</td>
<td>VSU02259</td>
<td>Malcom</td>
<td>Baeringer</td>
<td><a href="mailto:malcombbaeringer@valdosta.com">malcombbaeringer@valdosta.com</a></td>
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<tr>
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<td></td>
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<td>Seymour</td>
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Creating an opaque view

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<td>cast('C' as varchar(200))</td>
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</tbody>
</table>
Creating an opaque view
Creating an opaque view

View Data from Table "VSU (pdborc)"."VSU"."VSU_RETENTION_DT_RULES"

<table>
<thead>
<tr>
<th>FULL_SPLITS</th>
<th>NODE_ID</th>
<th>PARENT</th>
<th>PREDICTION</th>
<th>ROW_COUNT</th>
<th>SPLIT</th>
<th>SURROGATE</th>
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</thead>
<tbody>
<tr>
<td>{HIGH_SCHOOL_GPA &lt;= 2.}</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>10</td>
<td>{SAT_ACT_MATH &lt;= 407.5} {SAT_ACT_MATH &gt; 407.5}</td>
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<tr>
<td>{HIGH_SCHOOL_GPA &lt;= 2.}</td>
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<td></td>
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<tr>
<td>{HIGH_SCHOOL_GPA &lt;= 2.}</td>
<td>11</td>
<td>4</td>
<td>1</td>
<td>2298</td>
<td>{SAT_ACT_VERBAL &lt;= 535} {SAT_ACT_MATH &lt;= 605} {SAT_ACT_MATH &gt; 605}</td>
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</tr>
<tr>
<td>{HIGH_SCHOOL_GPA &lt;= 2.}</td>
<td>12</td>
<td>4</td>
<td>1</td>
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<tr>
<td>{HIGH_SCHOOL_GPA &lt;= 2.}</td>
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<td>5</td>
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<td>1249</td>
<td>{SAT_ACT_VERBAL &lt;= 462} {SAT_ACT_MATH &lt;= 415} {SAT_ACT_MATH &gt; 415}</td>
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</tr>
<tr>
<td>{HIGH_SCHOOL_GPA &lt;= 2.}</td>
<td>14</td>
<td>5</td>
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<td>{HIGH_SCHOOL_GPA &lt;= 2.}</td>
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<td>7</td>
<td>1</td>
<td>65</td>
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<tr>
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<td>16</td>
<td>7</td>
<td>1</td>
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<tr>
<td>{HIGH_SCHOOL_GPA &gt; 3.4}</td>
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<td>6</td>
<td>1</td>
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</tr>
<tr>
<td>{HIGH_SCHOOL_GPA &gt; 3.8}</td>
<td>18</td>
<td>8</td>
<td>1</td>
<td>807</td>
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<td>{HIGH_SCHOOL_GPA &gt; 3.8}</td>
</tr>
</tbody>
</table>
Oracle Answers for Ad-Hoc Queries
The density plots show the retention probability distribution. The ECDF plot shows the empirical cumulative distribution function for the retention probability.

- The red vertical line is the decision threshold (0.65). Under it students are predicted not-retained.
- The green line corresponds a particular chosen student. For this case we picked NEW_STUDENT_ID = "00ACA7A29C707FCC5E40C9AB5C899D"

These plots were generated for the Generalized Linear Model (GLM) prediction.
### Decision Tree Rules with Drill to Student ID

Displays Decision Tree Rules which drill into the Student ID's that fall into those rules

Time run: 8/13/2014 12:26:48 PM

<table>
<thead>
<tr>
<th>Rule Number</th>
<th>Full_splits</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>(HIGH_SCHOOL_GPA &lt;= 2.254999999999999) AND (SAT_ACT_MATH &gt; 407.5)</td>
</tr>
<tr>
<td>11</td>
<td>(HIGH_SCHOOL_GPA &lt;= 2.615) AND (HIGH_SCHOOL_GPA &gt; 2.254999999999999) AND (SAT_ACT_VERBAL &lt;= 535)</td>
</tr>
<tr>
<td>12</td>
<td>(HIGH_SCHOOL_GPA &lt;= 2.615) AND (HIGH_SCHOOL_GPA &gt; 2.254999999999999) AND (SAT_ACT_VERBAL &gt; 535)</td>
</tr>
<tr>
<td>13</td>
<td>(HIGH_SCHOOL_GPA &lt;= 2.985000000000001) AND (HIGH_SCHOOL_GPA &gt; 2.615) AND (SAT_ACT_VERBAL &lt;= 462.5)</td>
</tr>
<tr>
<td>14</td>
<td>(HIGH_SCHOOL_GPA &lt;= 2.985000000000001) AND (HIGH_SCHOOL_GPA &gt; 2.615) AND (SAT_ACT_VERBAL &gt; 462.5)</td>
</tr>
<tr>
<td>15</td>
<td>(HIGH_SCHOOL_GPA &gt; 2.985000000000001) AND (HIGH_SCHOOL_GPA &lt;= 3.455000000000001) AND (SAT_ACT_VERBAL &lt;= 415)</td>
</tr>
<tr>
<td>16</td>
<td>(HIGH_SCHOOL_GPA &gt; 2.985000000000001) AND (HIGH_SCHOOL_GPA &lt;= 3.455000000000001) AND (SAT_ACT_VERBAL &gt; 415)</td>
</tr>
<tr>
<td>17</td>
<td>(HIGH_SCHOOL_GPA &gt; 3.455000000000001) AND (HIGH_SCHOOL_GPA &lt;= 3.885)</td>
</tr>
<tr>
<td>18</td>
<td>(HIGH_SCHOOL_GPA &gt; 3.885)</td>
</tr>
</tbody>
</table>
Receiver Operating Characteristic Plots

ROC : GLM for RETAINED 1YR
An ROC plot (short for Receiver Operating Characteristic) gives an understanding of how well the model predicts the target value.

ROC : DT for RETAINED 1YR
Real-Time Math At-Risk Models

Decision Tree Model that Determines At-Risk in Math
Displays rules that were generated from decision tree model to determine if a student is at risk
Time run: 8/13/2014 10:38:35 AM

<table>
<thead>
<tr>
<th>Rule Number</th>
<th>Rule that Determines At-Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>(HSGPA in (“2”) ) AND (HSRank in (“1” “2” ))</td>
</tr>
<tr>
<td>11</td>
<td>(HSGPA in (“2”) ) AND (HSRank in (“3” “4” “9” ))</td>
</tr>
<tr>
<td>12</td>
<td>(SAT_MATH &lt;= 485) AND (HSGPA in (“3”) ) AND (HSRank in (“1” “2” ))</td>
</tr>
<tr>
<td>13</td>
<td>(SAT_MATH &lt;= 485) AND (HSGPA in (“3”) ) AND (HSRank in (“3” “4” “9” ))</td>
</tr>
<tr>
<td>14</td>
<td>(SAT_MATH &lt;= 485) AND (HSGPA in (“4”) )</td>
</tr>
<tr>
<td>15</td>
<td>(SAT_MATH &gt; 485) AND (HSGPA in (“3”) )</td>
</tr>
<tr>
<td>16</td>
<td>(SAT_MATH &gt; 485) AND (HSGPA in (“4”) )</td>
</tr>
<tr>
<td>8</td>
<td>(HSGPA in (“1”) ) AND (SAT_MATH &lt;= 485)</td>
</tr>
<tr>
<td>9</td>
<td>(HSGPA in (“1”) ) AND (SAT_MATH &gt; 485)</td>
</tr>
</tbody>
</table>

At-Risk Students by Course Name
Displays At-Risk Students by Course Name
Time run: 8/13/2014 10:38:35 AM

Number of At-Risk Students by Class

- Analyze - Edit - Refresh - Print - Add to Briefing Book - Copy
Information Discovery

- Analyze data from any source
- Measure and quantify student engagement
- Combine both structured and unstructured data
- Provide sentiment analysis on surveys and social media
- Measure the impact social and engagement metrics have on retention and graduation rates
Oracle Endeca Information Discovery

Understand the Complete Picture with Context from Any Source

Data Warehouse / Business Intelligence
Banner/ODS
PeopleSoft
One Card

Government Agencies
Bureau of Labor/Statistics
INSLDS/FAFSA/IFAPS

Websites
Sports
Other HigherEd

Social Media
Student Sentiment/Blogs/Tweets

Verbatim Text
Surveys and Evaluations

“..student heard a rattling sound toward left front side of room. Had issues with understanding professor…”

“..Valdosta State wins another state championship…”
“...University of Georgia hires a new vice president.”

“Love Valdosta University. The campus is in a great area. It is large enough to have everything you need, but still small enough…….”

“ProdID Wk CustID Date Dealer Price
506 25 1233 10/3 Dealer1 $35,000
507 26 1545 09/4 Dealer2 $22,000

Student Record

<table>
<thead>
<tr>
<th>Stud ID</th>
<th>Clas ID</th>
<th>Sec</th>
<th>Da</th>
<th>Inst</th>
<th>Cours</th>
<th>Spend</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>12324</td>
<td>506</td>
<td>234</td>
<td>12/3</td>
<td>1233</td>
<td>Class1</td>
<td>$300</td>
<td>$200</td>
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<tr>
<td>12325</td>
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<td>235</td>
<td>12/4</td>
<td>1545</td>
<td>Class2</td>
<td>$450</td>
<td>$900</td>
</tr>
</tbody>
</table>

Verbatim Text
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<td>12/4</td>
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Purchase Metrics

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<th>Value</th>
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<tbody>
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<td># Students</td>
<td>14,603</td>
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<tr>
<td>Total $ Amount</td>
<td>$16,054,431</td>
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<td>Total Transactions</td>
<td>1,912,588</td>
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<td>Avg $ per Transaction</td>
<td>$8.39</td>
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<td>Transactions Per Day</td>
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AMOUNT (sum) by Merchant Name

Sort: Merchant Name

Merchant Name:
- 1 Card
- Beverage
- Dining
- iValidate Events
- Laundry
- Off Campus Tapingo
- On Campus Tapingo
- Parking
- Printing
- Snack
- Student Health
- Student Rec
- University Stores
- Verifones

Value | Color
------|------
AMOUNT (sum) | Merchant Name
Contact Information

Andy T. Clark  
Vice President for Enrollment, Marketing and Communication  
(229) 375-1713  
atclark@valdosta.edu

Brian A. Haugabrook  
Chief Information Officer  
(229) 292-1910  
bahaugab@valdosta.edu